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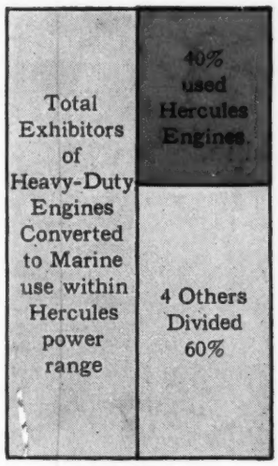
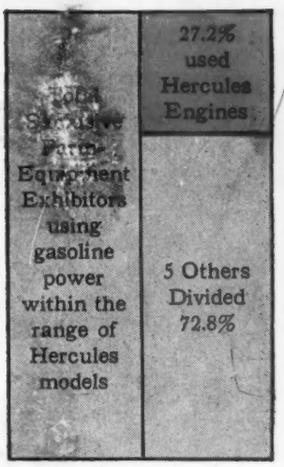
Chicago, July 7, 1928 (*Issued Every Other Week*) Volume XXXI, No. 14

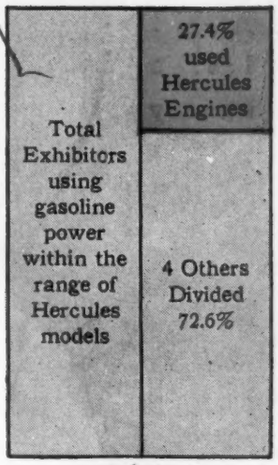
Hercules Engines


Total Exhibitors of Heavy-Duty Engines Converted to Marine use within Hercules power range
40% used Hercules Engines
4 Others Divided 60%

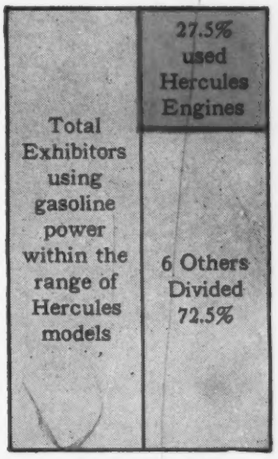
Motor Boat Show
New York City
January 20-28, 1928


Total Exhibitors using gasoline power within the range of Hercules models
27.2% used Hercules Engines
5 Others Divided 72.8%

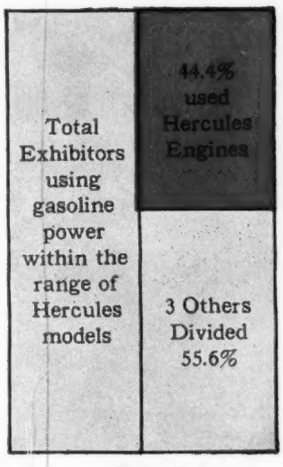
Southwestern
Road Show
Wichita, February 21-24, 1928


Total Exhibitors using gasoline power within the range of Hercules models
27.4% used Hercules Engines
4 Others Divided 72.6%

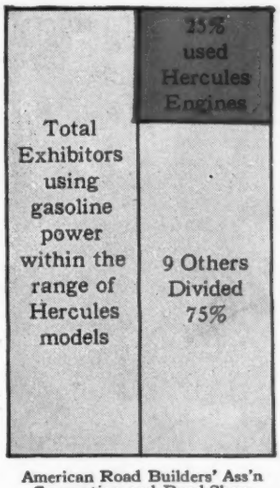
Western Road
and Equipment Exhibition
Los Angeles, March 7-11, 1928


Total Exhibitors using gasoline power within the range of Hercules models
27.5% used Hercules Engines
6 Others Divided 72.5%

Fourth National
Petroleum Exposition
Tulsa, Sept. 24-Oct. 1, 1927


Total Exhibitors using gasoline power within the range of Hercules models
44.4% used Hercules Engines
3 Others Divided 55.6%

National
Railway Appliance Show
Chicago, March 5-8, 1928


Total Exhibitors using gasoline power within the range of Hercules models
25% used Hercules Engines
9 Others Divided 75%

American Road Builders' Ass'n
Convention and Road Show
Cleveland, January 9-13, 1928

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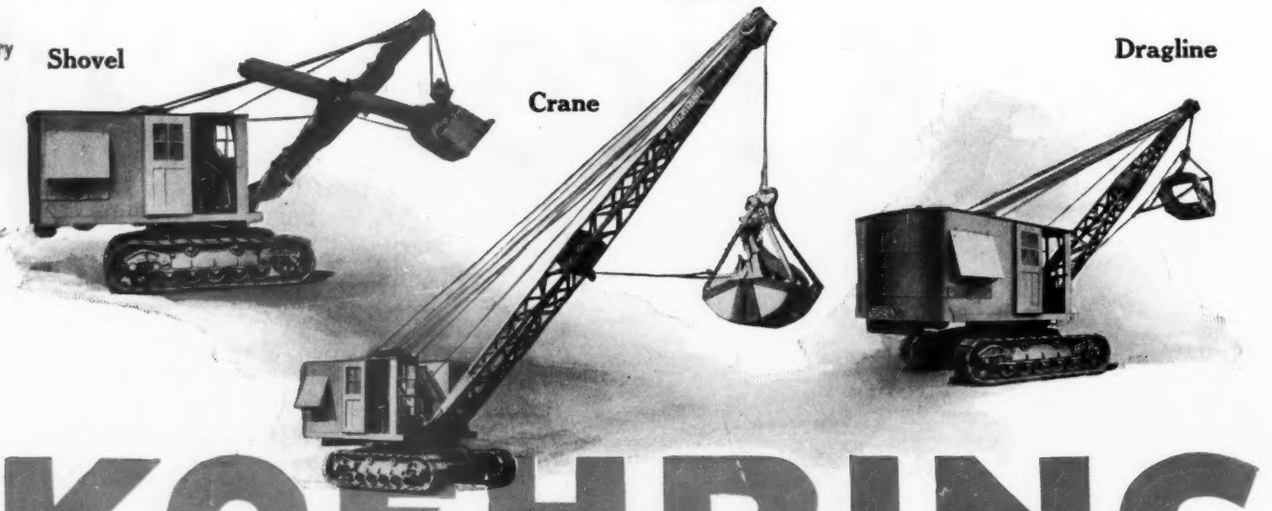

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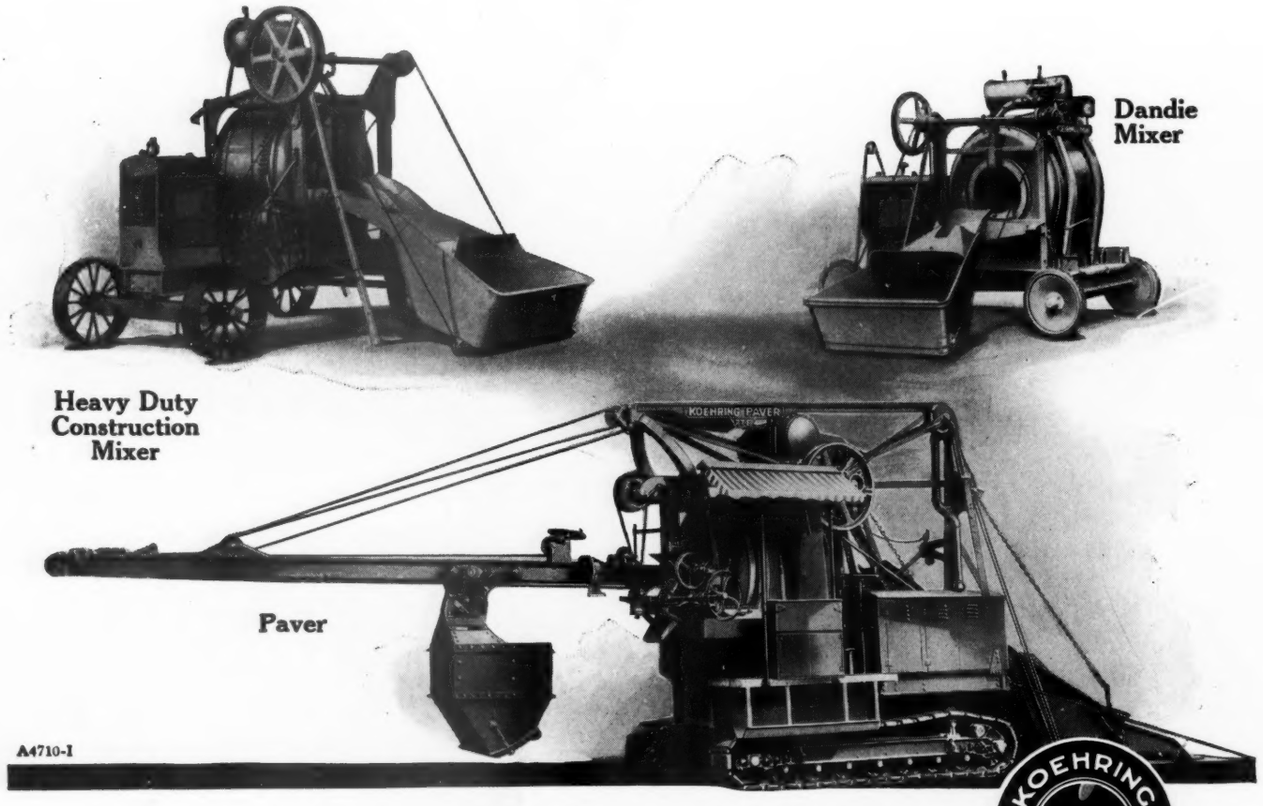

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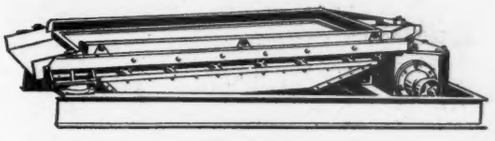
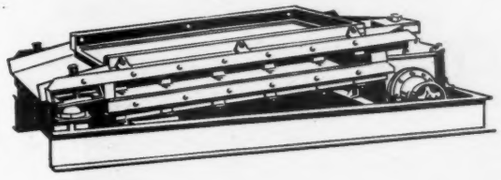


No. 18 Heavy Duty ROTEX with two decks, each 4 ft. by 6 ft.



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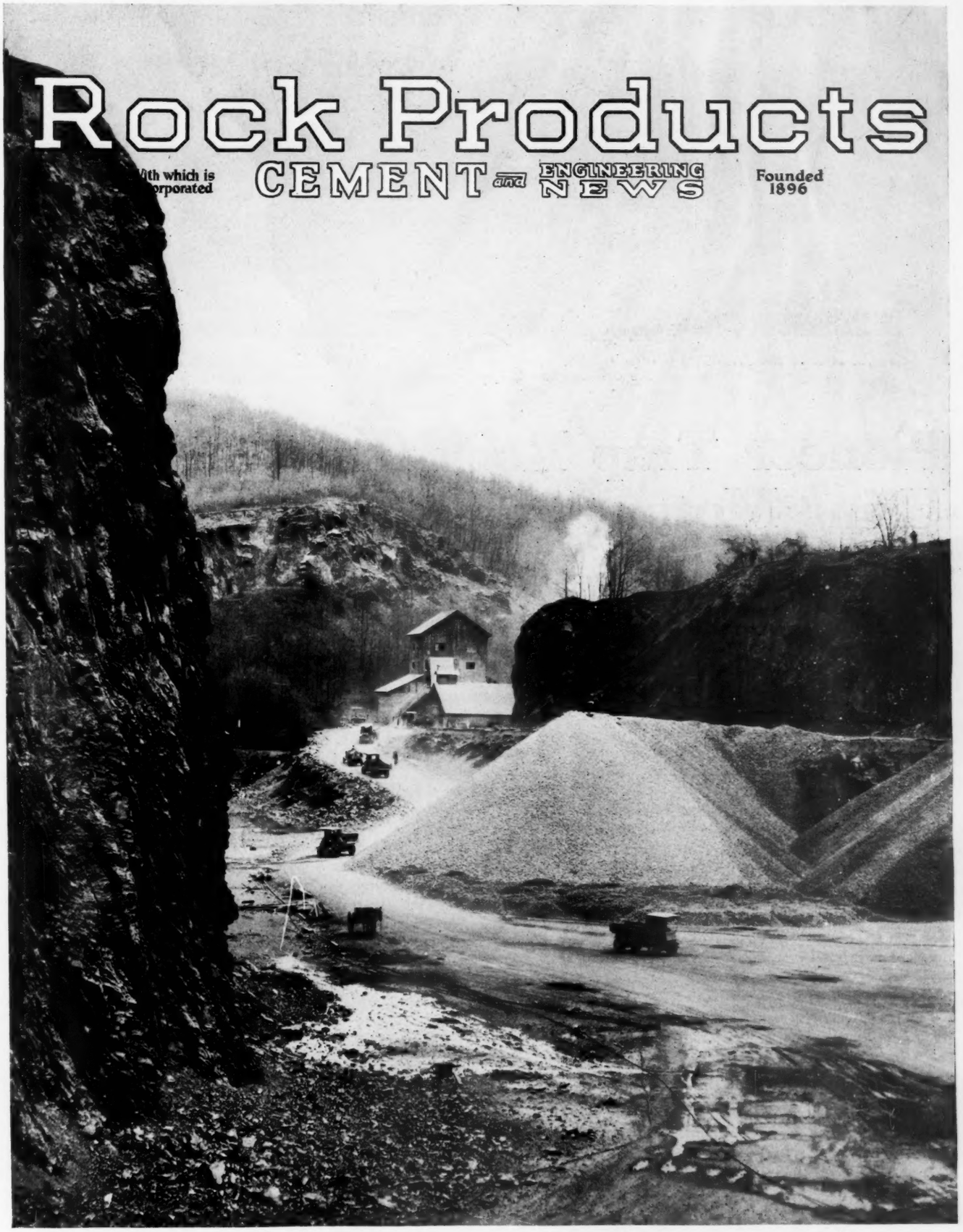


The crushing plant of the John T. Dyer Quarry Co., at Trap Rock, Penn., from the quarry, showing the trucks using the incline to this plant, and the face of the other quarry, not at present being operated, beyond. Note the last remaining horse of the former operation, now being used for odd hauling about the plant

General view of the John T. Dyer Quarry Co. quarry, at Trap Rock, Penn., showing the two levels, and illustrating how smooth the floor of the quarry can be made for the use of the trucks

Pioneer Trap Rock Crushing Plants Using Motor Trucks for all Hauling

Two Plants of the John T. Dyer Quarry Co., near Birdsboro, Penn., Have Interesting History of Change from Horse Operations to Truck Operations—One of the First Truck Installations

AT the present time there has been considerable discussion regarding the advisability of hauling at quarries by motor trucks. Recently a number of the newer operations have started out to use motor equipment from the first, while some of the older quarries have found it desirable to change from quarry-car operation to a complete trucking operation. It is not the purpose of this article to set up arguments for or against the use of motor trucks in quarries, but merely to show that in one instance at least the use of trucks has worked out to the satisfaction of the operators. This particular operation is of more than ordinary interest because this quarry was one of the very first to use motor trucks exclusively.

The John T. Dyer Quarry Co., Norristown, Penn., now uses motor trucks at two of its three plants. At these quarries the problem was not one of scrapping an existing track system to make way for the motor equipment, because these quarries were operated for many years before the coming of the "motor age" by horse-drawn equipment. Hence the fact could be met squarely —truck or track—and in this case it was decided in favor of the former.

A general view of the quarries and plants of the two truck-operated plants would be worth while to understand the reasons for the selection of trucks at the plants. The quarry at Trap Rock, Penn., near the town of Birdsboro, Penn., which is about 25 miles from the home offices of the company at Norristown, is in the mountains of eastern Pennsylvania and has been opened in an outcropping trap-rock formation. This formation follows a general east-and-west direction and it is in the outcropping of the same formation several miles away to the west that the other truck-operated quarry is to be found, at Clingan, Penn. Strictly speaking, the company owns two adjacent quarries at Trap Rock, each with its own crushing plant, but the one to the east of the railroad is not at present being operated. The layout of the other quarry shows the crushing plant and other buildings of the quarry grouped along the west side of the railroad with high hills rising immediately to the north, and through between two of these hills lies the entrance to the quarry. The quarry is roughly circular in shape with a remarkably level floor.

Bench Quarrying on Two Levels

One of the chief characteristics of the quarry is its high face, which is nowhere less than 120 ft. and at some points rises considerably higher. This face is at present in two levels, with the work going on at the lower level, which has a face of approximately 45 ft. The rock of the quarry is a good grade of trap rock, remarkably tough and hard. Drilling and blasting in this rock is bound to be a problem, but it has been worked out satisfactorily by the Dyer company. Drilling is done by two Armstrong well drills, the holes being driven down to a depth of 49 or 50 ft. This makes a breast of about 45 or 46 ft. The drilling in this rock averages 1½ ft. per hour. The holes are spaced 15 ft. apart and a distance equal to half the depth of the hole back from the face, or approximately 25 ft. back. The usual blast is 12 to 15 holes at one time, although it may run as high as 30 holes on occasions. Sticks of 40% and 60% gelatin dynamite, 5 in. in diameter and 2 ft. long, are used. Generally one shot brings down 25,000 to 30,000 tons, which is enough to supply the crushing plant with a month's work. Secondary shooting is done both by plug drilling and mud-capping, the former being the more common. Ingersoll-Rand jackhammers are used for this drilling, compressed air being supplied to the quarry through long lines from the plant. Forty per cent dynamite 8x1½ in. is used for this shooting.

Four Marion revolving steam shovels are

used in the quarry. Three of these are Model 31 with 3¼-yd. buckets and the other is a Model 30, also with a 3¼-yd. bucket. One of these shovels is used to reclaim the crushed stone from the large storage piles on either side of the entrance to the quarry, and the others load the rock to the waiting trucks to be taken to the crusher. At this quarry the first use of a small revolving shovel for loading the stone was in September, 1912.

Crushing Plant

The way to the crushing plant is up a grade from the level quarry floor. The slope is gradual, but there is a rise of more than 45 ft. between the quarry floor and the crusher. It is obvious that the original level of the quarry floor was very nearly at the same elevation as the crusher, but the company has felt it more economical to open the lower level than to enlarge the upper level, although at present sufficient adjacent property is owned to permit the expansion. It has taken five years to produce the "hole" which is now the lower level of the quarry.

At the crushing plant, the trucks dump to either of two chutes made of pieces of railroad rail, which send the material to the two primary crushers. These are 18x36 in. Blake patent jaw crushers, manufactured by the Farrell Foundry and Machine Co. These crushers discharge to a 28-in. belt conveyor of 28-ft. centers, which carries the material to the boot of a 24-in. bucket elevator. The elevator discharges to a 5x15-ft. revolving scalping screen. This screen, which revolves on a shaft through its center, was practically made at the plant, as was also the bucket elevator mentioned above. The scalping screen has five 3-ft. sections, the first two of which contain 1¾-in. holes to make 1¼-in. stone, the third having 2¼-in. holes for 1½-in. stone, and the last two having 3-in. holes for railway ballast. The 1¼-in. stone drops down to the secondary screen below, while the 1½-in. and 3-in. pass to bins on the lower floor. The rejects go to a 30x13-in. secondary jaw crusher, also made by the Farrell company. The discharge of this crusher returns to the 28-in. belt conveyor under the primary crushers.

The crushing plant at Trap Rock, showing the 10% incline up from the floor of the quarry

The secondary screen is a revolving 4x18-ft. cylinder with a 12-ft. dust jacket. The inside first two sections of this screen have ¾-in. holes to produce ½-in. stone, and the jacket has ½-in. holes through which the finer material passes to a third screen. The secondary screen also separates ¾-in. stone and the rejects pass to the bin below as 1¼-in. stone. The third screen is also a home-made revolving screen and is 3x12 ft. This screen separates the ¼-in. stone and fine screenings. There are 10 reinforced concrete bins below the screens. Two of these generally are for ballast stone, a small one for miscellaneous, and the other bins contain 1½-in., 1¼-in., 1-in., ¾-in., ½-in., ¼-in. and fine screenings. The bins hold 600 tons. Railroad tracks run under the bins for loading directly from them by chutes.

This crushing plant is by no means a new one, as it was built in 1908, nor is it a large operation, as it averages about 1000 tons a day. However, the production can be increased to 1200 tons or even 1500 tons per day if necessary. During last year 250,000 tons were produced at the plant.

Steam-Power Operation

As this plant is about 20 years old, it is not surprising to find steam being used for power throughout. The company is contemplating changing to electricity. The crushers, screens and conveyors are all belt-driven by a steam engine with steam supplied by three Scotch marine-type boilers. Water is pumped from Hay Creek, not far from the plant, by Worthington and Snow pumps. Besides being used for the boilers, this water is also used to run over the crushers which are operated under a stream of water all of the time.

At the plant there is also a building for supplying the compressed air used. This building contains two other marine type boilers which operate two 14x14½ Ingersoll-Rand air compressors. There is a 2½-in. pipe line for air to quarry No. 2 (the quarry now being operated), which is 2550 ft. long.

The quarry at Trap Rock, with the storage piles at either side and the start of the incline at the left

Shovel reclaiming material from storage pile, with truck dumping to the other pile at the right

The plant at Trap Rock, with the entrance to the quarry showing at the left, the crushing and screening plant in the center, and the air compressor building at the right center

There is also a 3-in. line, about 1925 ft. long, for the quarry across the railroad tracks. This air is used for the jackhammers, and tripods, and also in the shop.

The other buildings at the plant include an office, a shop and a garage for the quarry trucks, which was a stable when the plant was horse-operated.

A Pioneer Crushed Stone Quarry

The Birdsboro quarry was first opened in 1893 by the late John T. Dyer, who died about 20 years ago. At that time there was no good road from the quarry to the town of Birdsboro, a distance of something over a mile, and the company built its own road with rock from the quarry. This road has now become part of the state system, and is still known as the Hay Creek road.

Mr. Dyer, who first planned this quarry, was an old-time railroad contractor, and it was the need of good railroad ballast that influenced him to begin this operation. The present superintendent of the quarry, Harry Schwartz, was also a railroad man, working with Mr. Dyer, and he has been with the quarry company for 40 years now. Started as it was by men schooled in the railroad field, it is rather surprising that this quarry should not be operated with quarry tracks and cars, but Mr. Schwartz says that his combination of quarry training and railroad training has made him certain that the truck operation gives the better service in this case. As he says, he "would rather be getting out stone than shifting track."

Harry Schwartz, superintendent at Trap Rock

As mentioned before, this quarry was originally operated by horse-drawn vehicles. Sixty-four horses were used in this quarry, and these had become so used to the operation that they could take a load from the shovel to the crusher and turn and back to the crusher openings without being guided in the least, according to the present stories.

The first motor truck was purchased in September, 1918, as an experiment, and was followed shortly by others. These first trucks were Autocars of 1½ or 2 tons. They have given good service and have the advantage of quick and easy movements at the shovel in the quarry, and also at the crushers. However, the small capacity of these trucks is a decided disadvantage, and the later trucks which the company bought have been larger Autocars with 3½-yd. Heil dump bodies. There are now six of the larger trucks in operation.

At the Trap Rock plant there is an average of nine trucks operating at one time, with one driver for each truck. Then there are two men for each shovel, or eight in all. For work in the quarry (drilling, plugholing and cleaning up) there is a gang of about 13 men. It is interesting to note here that at this plant it is not necessary to have men at work in the quarry leveling off the floor for the trucks, as the shovel operators are able to maintain the proper grade without outside aid. Not a hand shovel is touched to the quarry floor. At the crushing plant there are four crusher feeders, three men for the boiler room, one car loader and one man to help the car loader. This makes a total of nine men at the plant, and with the 24 men at work in the quarry, there is a total force of 33 men operating the plant.

Bar inclines to the two primary jaw crushers on to which the trucks dump their loads

Dumping a load of stone to one of the primary crushers at the Trap Rock crushing plant

Loading to truck in the quarry at Trap Rock

The quarry at Clingan, showing the size of the pieces

A comparison of operating costs at the company's truck-operated quarries, such as is given in the table below, necessitated some information on the other plant at Clingan, Penn. This quarry is essentially a bluff quarry with the crushers practically on a level with the floor of the quarry. The plant clings to the side of the steep bank, and the layout is very nicely completed by the connection to the Pennsylvania railroad, which runs past the foot of the plant. At present this plant is being completely remodeled, changing it from a plant run by steam to an electric plant. A new Symons cone crusher and two new revolving screens have been installed during the remodeling. The same methods of quarrying are used at Clingan as at Trap Rock, with one Model 37 Marion shovel and two Model 31 Marions. The average haul for the trucks is 750 ft.

It will be noted that the data below is for three-ton trucks, since the company is replacing the lighter equipment with trucks of that size. It also includes idle time for labor and equipment when the plants are closed for repairs or bad weather.

COST DATA ON OPERATING 3-TON TRUCKS AT DYER QUARRIES DURING 1927

	Birdsboro, cost per ton	Clingen, cost per ton
Labor operating	$0.442	$0.0276
Gasoline	.0162	.0108
Labor repairs equipment	.0089	.0057
Material repairs equipment	.0122	.0040
Labor repairs, garage	.0011	.0001
Material repairs, garage	.0035	.....
Tools and miscellaneous supplies	.0073	.0041
Lubricants	.0039	.0019
Mechanical shop overhead	.0012	.0018
Insurance	.0023	.0017
Depreciation	.0189	.0219
	$0.1197	$0.0796
Average daily haul	900 tons	900 tons

Effect of Length and Time of Haul

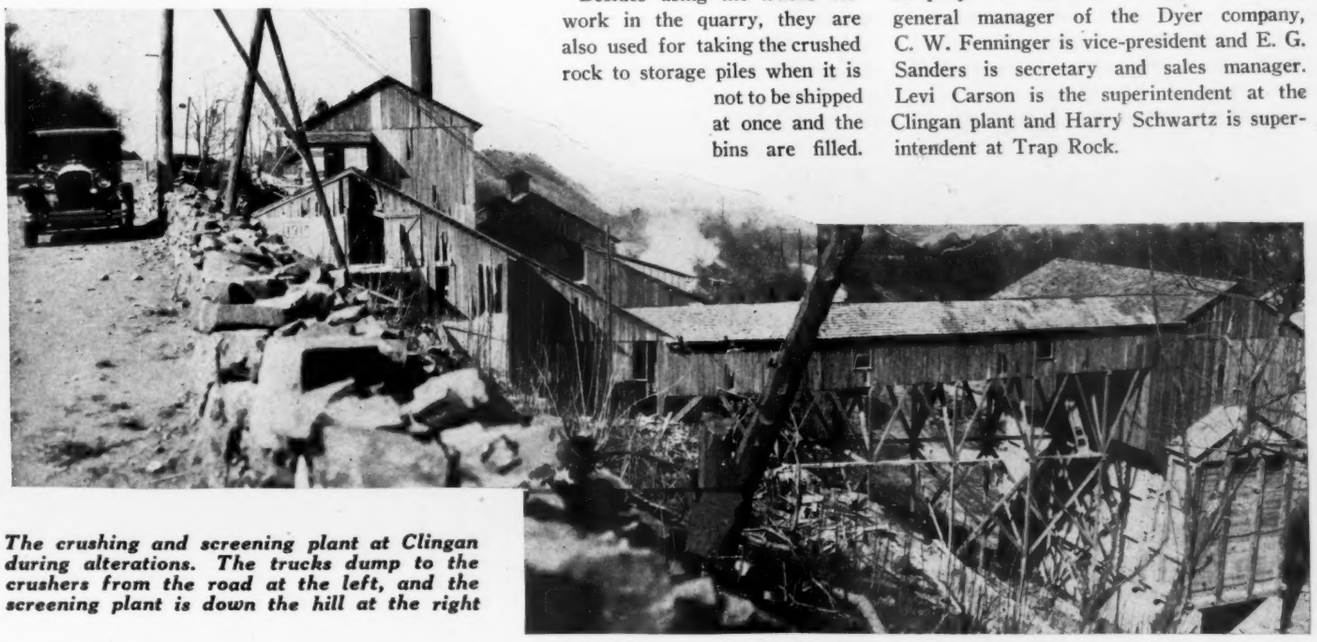
It is interesting to note how closely the cost data bears out the conclusion that longer hauls and grades make the costs of truck operation mount tremendously. At Trap Rock during 1927, sixty thousand more tons of rock were quarried than at Clingen, which should bring the cost for operating per ton to a lower figure, but instead the figure is much higher. The answer, of course, is that at Trap Rock the average haul is 250 ft. further and that there is a raise of 45 ft. with a 10% grade.

Besides using the trucks for work in the quarry, they are also used for taking the crushed rock to storage piles when it is not to be shipped at once and the bins are filled. Two large storage piles are located at the Birdsboro plant, one on either side of the edge for dumping. Wood troughs laid on top of the storage piles provide trackways for hauling the stone.

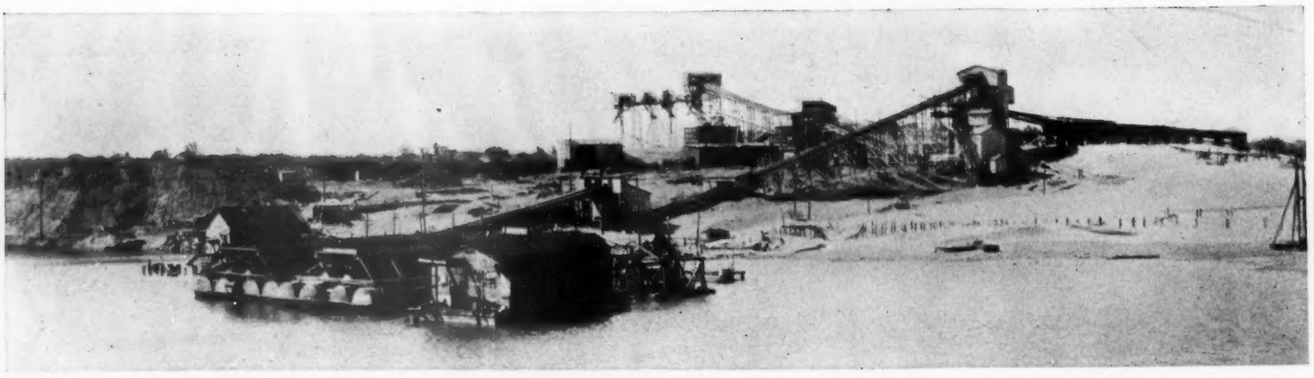
This quarry does not deliver any of its product by truck, although every day trucks of the nearby contractors come to take the stone away. During the season, as much as 1000 tons a day may be trucked out. The balance of the stone from Trap Rock is shipped out over the Reading railroad, and since the rock at Clingan is shipped over the Pennsylvania railroad, this provides excellent facilities to all parts of the state.

The Dyer company has done considerable progressive advertising. The company has gotten out a series of folders describing the advantages of trap rock for road work, ballast and other uses.

The company's main office is at Norristown, with a sales office in Philadelphia. Three plants are being operated, the one at Clingan comprising 250 acres owned by the company and the Trap Rock quarry comprising about 1000 acres now leased by the company. F. T. Gucker is president and general manager of the Dyer company, C. W. Fenninger is vice-president and E. G. Sanders is secretary and sales manager. Levi Carson is the superintendent at the Clingan plant and Harry Schwartz is superintendent at Trap Rock.



The crushing and screening plant at Clingan during alterations. The trucks dump to the crushers from the road at the left, and the screening plant is down the hill at the right



The Ward Sand and Gravel Co. plant at Oxford. Mich., seen from across the dredging basin

General Observations on the Detroit Sand and Gravel Territory

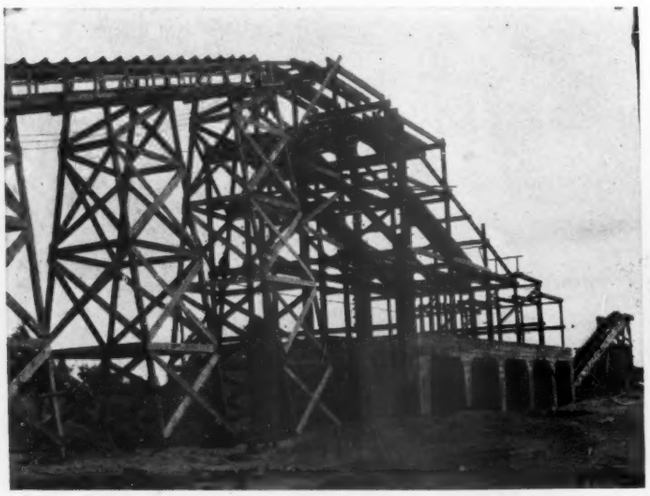
Recent Developments in Methods of Operation on Both Large and Small Scale

By Edmund Shaw
Editor, Rock Products

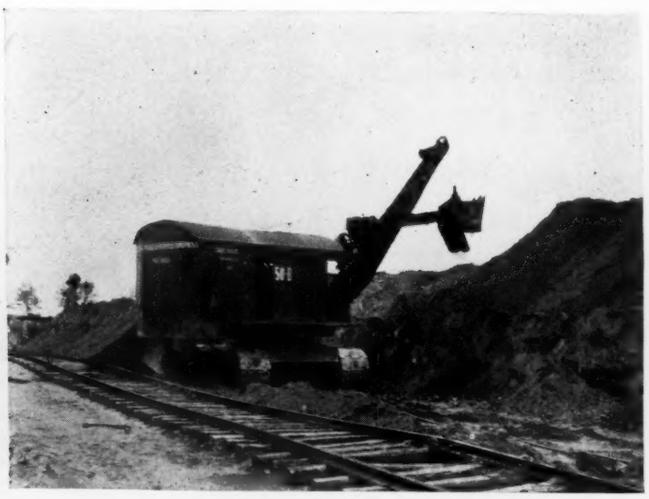
AN event which interested the entire sand and gravel industry of the United States was the recent acquirement by lease or purchase of plants in the Oxford, Mich., district (35 miles from Detroit) by the American Aggregate Corp. (formerly the Greenville Gravel Corp.). With the plants which it had already built in this field this action made the company the largest producer in a district where big production was already the rule. So much interest was evidenced that it seemed a good time for a survey of the field and its resources, and what follows are the observations made during a visit to some of the larger plants in the early part of this month.

The time chosen was somewhat unfortunate, as it was at the end of one of the longest spells of wet weather Detroit has known in years. Construction of all kinds and especially highway construction was badly delayed and many of the plants had been forced to cease shipments, as the customers could not store more materials. But with the coming of good weather it was expected that shipments would be unusually heavy, as the record shows that very large yardages of concrete will be used in contracts already awarded.

Oxford was the first point visited, as the greater number of plants are at or near this town. An article published in the January 23, 1926, issue of ROCK PRODUCTS covered the operations of this district, so what follows will concern itself with the changes and developments since that article was pub-

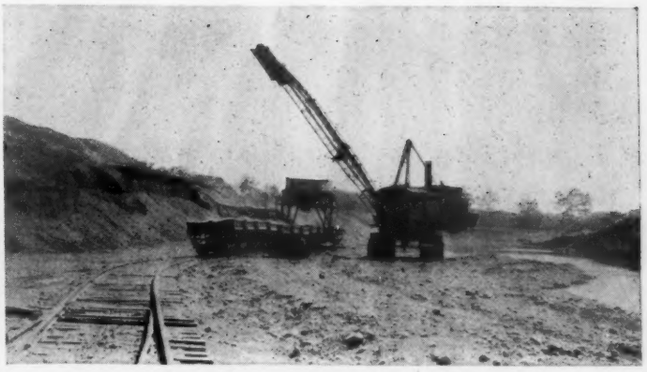


New gravel plant of the Koenig Coal Co. at Oxford under construction, showing the concrete open-ended bins and the supports for conveyor and screens



Shovel cutting the bank for new working track at the new Koenig plant. The track system at this operation is of unusually large capacity

Office building and car loading equipment at the new Koenig plant



Dragline and cars at the New Hudson, Mich., plant of the American Aggregate Corp.

lished, enough for an article in themselves.

New Plant Building at Oxford

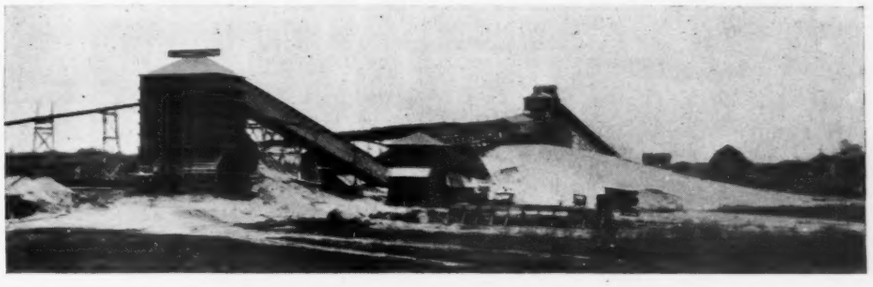
There are no new plants in the district, but the P. Koenig Coal Co. is building one which is expected to begin production about July 1. This is something of a novelty for the Oxford district, where the practice and the plant designs have been those worked out by the operators from experience obtained only in this field. The new plant has been designed by C. S. Huntington of the Link-Belt Co. and embodies those ideas which this company has acquired from building sand and gravel plants in every part of the United States, modified as necessary to meet many various local conditions.

Lance Hanley, manager of the new Koenig plant

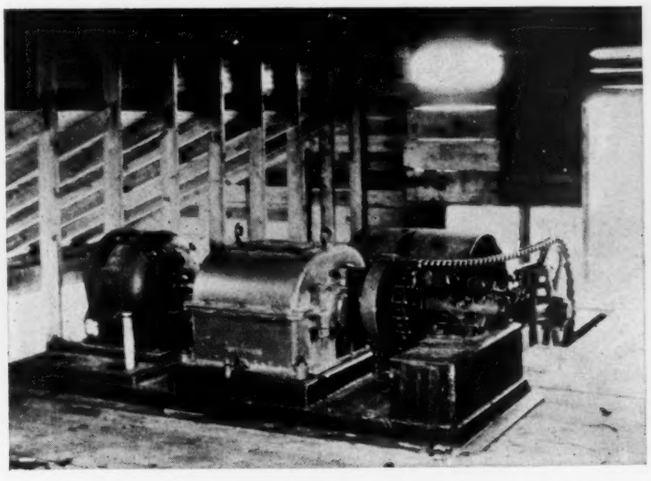
This will be a "dry" plant, as all plants which do not employ dredges are called in Oxford. The bank will be dug by an electric shovel, loaded on cars and brought to a track hopper and then sent to a scalping screen and crusher. From this point it will be taken to inclined conveyors and put through the usual Link-Belt screening and separating system.

When the plant was visited the open ended bins of concrete and the conveyor tunnel below were complete, the framing was largely completed, one crusher set and some of the other machinery was in place. The concrete track hopper was just being poured. The tracks were in, a splendid layout that offers plenty of track storage and the shovel was excavating for the working track, so it looked as though the schedule might easily be met. It was hoped to have this plant producing by June 1, but the heavy rains which have delayed all construction around Detroit in May and the early part of June held the work back.

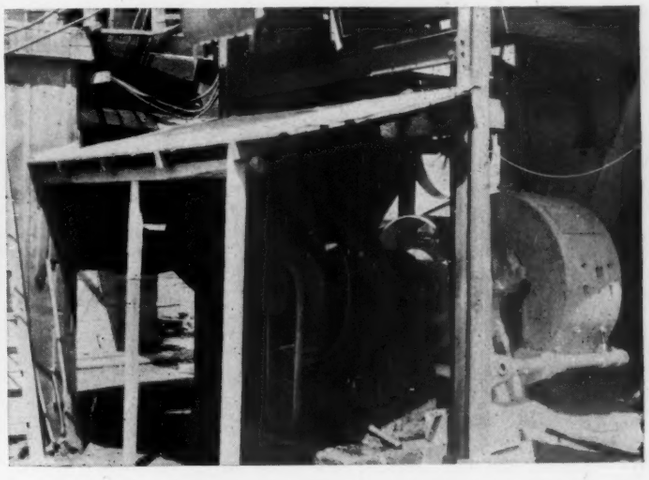
The new plant will have a capacity of 2500 to 3000 tons per day, and the company is producing that much from its other plant at Oxford. This was built in 1924-25 and described in detail in the November 28, 1925, issue of Rock Products. It is a dredging plant originally equipped with a 15-in. Morris pump and a 500-hp. Allis-Chalmers motor on the dredge and a duplicate pump and motor mounted on the shore. When this



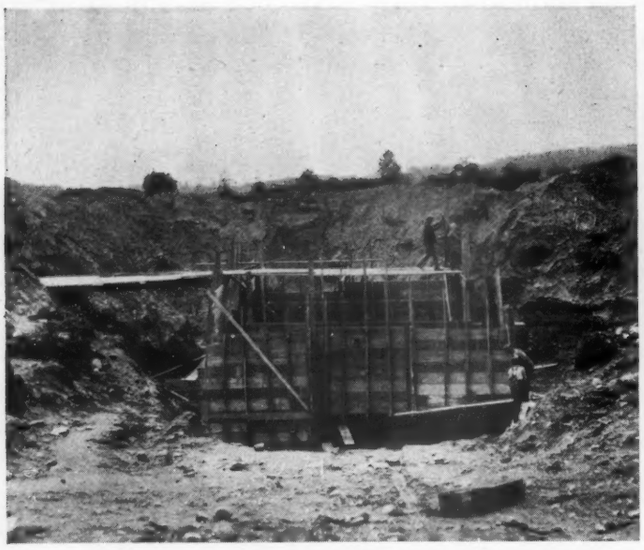
The older gravel plant of the P. Koenig Coal Co. at Oxford



Drive for the main conveyor at the new Koenig plant; speed reducer and sprocket chain



Disk crusher at the Standard Sand and Gravel Co. plant at New Hudson, Mich.



Pouring concrete for the track hopper at the new Koenig plant

Pit of the No. 1 plant of the American Aggregate Corp. showing the high bank

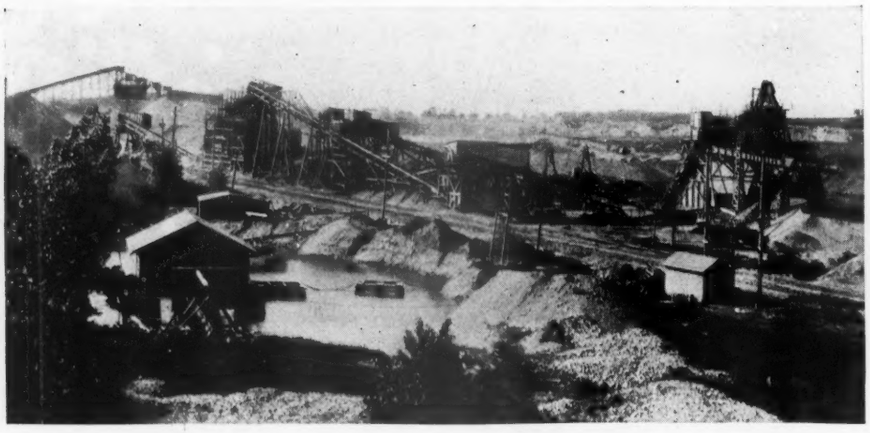
plant was visited recently a Swintek cutter (made by the Eagle Iron Works, Des Moines, Ia.) was being installed and it was expected that this would considerably increase the percentage of solids in the pump discharge and hence decrease the power bill. Up to this time the only aid to digging the gravel given the pump was that provided by a number of pressure jets around the mouth of the suction, a device which was developed in this field and one that has been in use there for some years.

Improvements in Centrifugal Pumps

The study of centrifugal pumps at the Koenig plant has brought about some important changes in pump design which have been embodied in a new pump made for this company by the American Manganese Steel Co. These consist in reducing the size of the runner from 51 in. (the diameter of the runner on the pump originally installed) to 40 in. and in lessing the "plunger space," the circular canal of the shell which is outside the runner. Theoretically, this would call for a higher speed (that is, r.p.m.) in order to maintain the same peripheral speed and pipe line velocity, but in practice the difference has not been noted. There is some saving of power, and what is of at least equal importance is the saving in the cost of repair parts and of lost time in making repairs. The smaller runner costs less and lasts longer.

J. A. Beuchler is superintendent of the old Koenig plant and Lance Hanley is in charge and is superintending the construction of the new plant. Mr. Hanley was formerly with the Leatham D. Smith Co., producers of crushed stone at Sturgeon Bay, Wis.

Former Fuller and Becker plant at Oxford, now owned by the American Aggregate Corp.



The Detroit-Oxford plant now owned by the American Aggregate Corp. The old dry plant is at the left, and the dredge plant is at the right

Three of the Oxford operations were not producing at the time the district was visited, Fuller and Becker, the Detroit-Oxford Gravel and Stone Co. and the J. C. Stewart Co. It was reported that the Fuller and Becker plant was being operated intermittently by its present owners, the new American Aggregate Corp., but that the Detroit-Oxford plant was to be kept closed, at least for the season, by the same company, which purchased it recently. The J. C. Stewart plant has been operated this season producing for delivery to points on the interurban railway on which it is located.

The Detroit-Oxford plant is usually spoken of as "Smith's plant" because it was built and operated for a long time by W. O.

The plant of the Ray Sand and Gravel Co. at Oxford, recently acquired by the American Aggregate Corp.

Smith, the pioneer operator of the district. When it was visited by the writer it was a "dry" plant using steam shovels to dig the bank. Its screening equipment was designed by Raymond W. Dull before he sold his business to the Link-Belt Co.

Since the operation was visited in 1925 the material above water level has been practically exhausted and the plant changed to a "wet" plant. A dredge with a 12-in. pump was built and a plant equipped to handle the dredge discharge was erected south of the old plant. It is said that the dredge met with unusual difficulties owing to the large stones that were encountered in the lower part of the deposit.

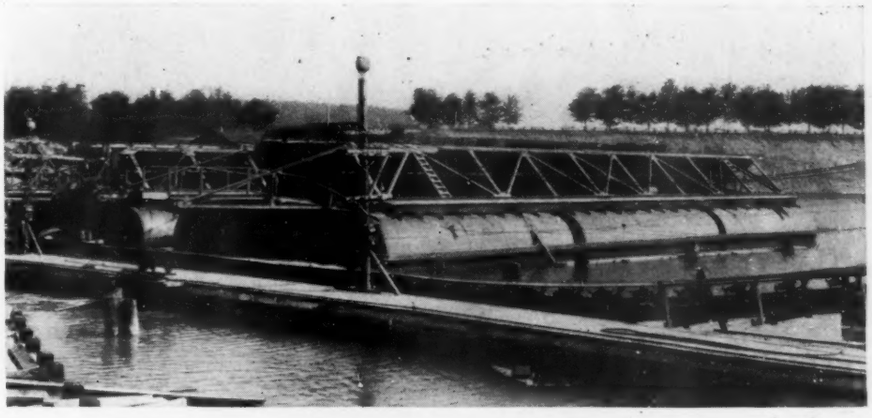
The Ray Sand and Gravel Co.'s plant at Oxford has been acquired by the American Aggregate Corp. and is reported producing steadily. This was formerly known as the United Fuel and Supply Co.'s plant and was described in the January 26, 1926 article referred to. It is the second largest producer in the Oxford field and is notable for the large crushing equipment that has been installed to care for oversize gravel. Under its present management a number of improvements have been made and are being made while production is going on. The superintendent is T. D. Folkerth.

The new dredge of the Ward Sand and Gravel Co. at Oxford

The Ward Plant

The remaining plant in the Oxford district is that of the Ward Sand and Gravel Co., which is the largest producer in the district, as it has been for some years. There is hardly a sand and gravel man in the country who does not know of the Ward operation, largely because of the controversy that has raged over the method of pumping that he has invented and patented. It is the intention to publish a detailed description of this operation shortly, so too much space will not be given to it here. But there are some matters of general interest concerning it that may be touched upon in an article of this kind.

The device was put in service in 1925 and was briefly described in the review of the sand and gravel industry given in Rock Products Annual Review number for that year. It was operated continuously through 1926 and 1927 and its success was such that the Ward company built a dredge, using the same device, which it put into service last April. Obviously, such an experiment would not have been continued if it had not been successful, and success in this case means that the cost is less with this method of pumping than it was with the centrifugal pumps previously employed.



Self-unloading barges with pontoon supports, at the Ward plant

T. L. Ward, the president and manager of the company gave the writer access to production records and power bills which showed the power cost by this method of pumping is not excessive. He says that it is considerably less than it was when centrifugal pumps were used and this appears to be borne out by the writer's general knowledge of pumping costs. The reason for the decreased cost is that the new device delivers a discharge which is very high in solids as compared with the discharge of a centrifugal pump, so that much less power is used in pumping water that has only to be thrown away when it reaches the top of the plant. The figures given at one of the other plants for the percentage of solids in the pump discharge were from 12% to 14%. With the Ward device the percentage of

Plant of the Standard Sand and Gravel Co. of New Hudson, Mich

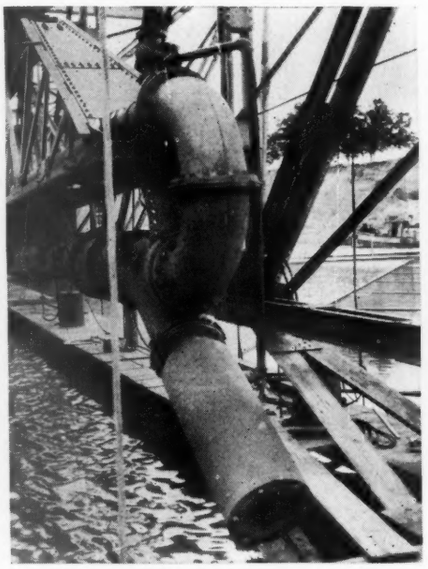
solids approximates 40%. The difference is enormous, far greater than the figures would indicate, without some interpretation, for a discharge with 14% solids would contain six tons of water to one ton of sand and gravel, while a discharge with 40% solids would contain only 1½ tons of water for each ton of sand and gravel. So a centrifugal pump might be a fairly efficient device as regards work done for each horsepower applied to it and yet give a high cost per ton for sand and gravel loaded on the car.

It is for this reason (the increase of solids in the pump discharge) that cutters applied to centrifugal pumps have been so successful everywhere in reducing power costs per ton. It is strange that cutters have not been used in the Oxford field until recently. One reason for this might be the big stones which are encountered quite regularly in all the deposits. It is reported that the new cutter being installed by the Koenig company is of a new type especially designed to deal with the big stones.

It will be interesting to observe comparative results in this field obtained from a centrifugal pump and cutter and the Ward device. Meanwhile it is of interest to know that so shrewd and successful an operator as J. D. Roquemore of Montgomery, Ala., has adopted the Ward device for the new plant which he is building in Florida, just across the line from Flomaton, Ala. He was at the Ward plant and studied the device for some time before deciding to use it.

The new Ward dredge is one of the first that has been designed to dig to a great depth and its 18-in. suction pipes are 115 ft. long and have actually dug to a depth of 110 ft. Usually, however, the dredge works at 70 to 80 ft. So long and heavy a burden as the suction pipes, with the jet water pipes (15-in. in diameter) and the heavy suction head and U turn for the jet water make, necessitates an unusual method of support and this is supplied by a regular bridge truss, one end resting on the dredge and the other on a large pontoon. It makes a most unusual looking affair, but the reason for such an elaborate and heavy construction is evident enough when the weight to be supported is taken into account.

The new dredge has a double unit and both units may be worked at once if necessary, although at present only one is worked while the other is held in reserve. The production for May, the first full month for which records were obtained, was 9112 tons per day. Theoretically, with both jets working, the dredge should make an output of about 1000 tons per hour. The first dredge of this type produced an average of 244 cars per working day for the seven months that it was operated in 1926, but it was working at a lesser depth and under more favorable conditions.



One of the suction pipes on the Ward dredge, with jet water pipe, and U-turn above

The self-unloading barges used and the method of conveying the material and washing and screening it are also interesting, but they must be left for a later and more detailed description. One of the recent improvements noted in the plant was the use of a Traylor vibrating screen and the interesting fact about its installation is that it is doing most of the work which had previously been done by a large traveling screen which had many times the screen area.

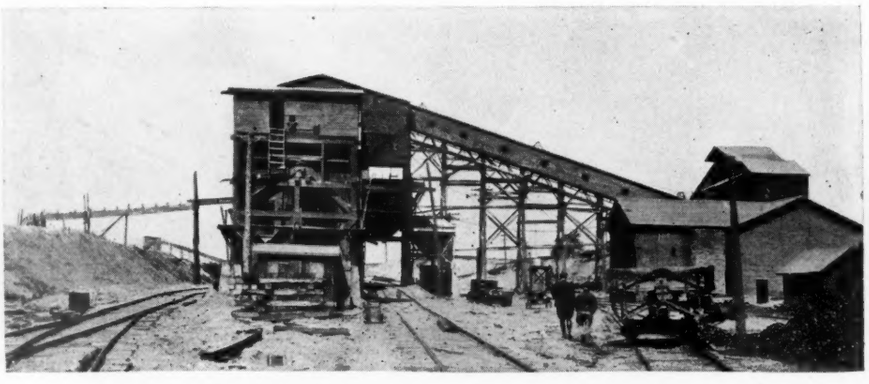
Plant at New Hudson

There are two plants at New Hudson, Mich., 22 miles west of Oxford. One of these belongs to the American Aggregate Corp., the other to the Standard Sand and Gravel Co. The American Aggregate plant is a "dry" plant producing about 50 cars daily.

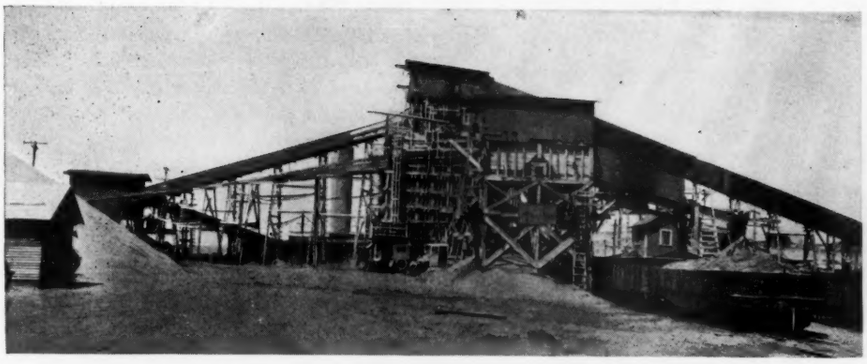
The bank material is dug by a Class 14 Bucyrus dragline and a Marion No. 33 shovel, both steam driven. A pit covering a good many acres has already been dug over by these machines. The material is loaded into Western side-dump standard gage cars and drawn into the track grizzly and hopper by Davenport locomotives. From the hopper a 36-in. belt lifts it to a scalping screen and the oversize goes to two Allis-Chalmers gyratory crushers and the discharge is sent with the undersize of the scalper to a 48-in. sizing screen 20 ft. long of Greenville Manufacturing Works make. This company is a subsidiary of the American Aggregate Corp. and it also made the 60-in. sand screen used in this plant. Beside these there are four conical screens. A Symons disk crusher is used for crushing to finer sizes. General Electric motors are used throughout.

The sand is recovered in settling tanks of hopper shape and discharged into cars by hand-controlled gates.

The American Aggregate Corp. plant was not in operation when it was visited, but was expected to begin operating later. Paul Kingsley is the superintendent.



American Aggregate Corp. plant at New Hudson



Plant No. 1 of the American Aggregate Corp. near Brighton, Mich.

The Standard Sand and Gravel Co. likewise has a dry pit operation and it uses a Bucyrus 95-65 electric shovel and two Marion electric shovels, a No. 28 and a No. 37, to dig the bank. The cars used at this pit are of a special hopper-bottom design which are built for this company. They are dumped over a track grizzly to a hopper from which the material goes up a 36-in. elevator to a primary screen.

There are three crushers in the plant, two No. 5 Gates gyratories and a Symons disk crusher. A considerable part of the plant's production is in what is known as "granite stone products," a trade name for crushed gravel. Much of this is "binder stone" used in the binder course of asphalt pavements. In addition to the crushed gravel product the output includes three sizes of pebbles and one size of sand. The sand is caught in tilting tanks (automatic sand settlers) which were designed and made at the plant.

This company strips its deposit, as there are from 2 ft. to 4 ft. of overburden. One of the steam shovels mentioned is used for stripping and a narrow-gage Lima locomotive hauls the dirt away. The company has another standard gage Lima locomotive and a Porter and an American. These are used in the pit. Everything about this plant is electrically driven except these locomotives. The shovels are on a 440-v. a.c. current and the plant motors on 220-v. a.c. General Electric and Fairbanks-Morse motors are employed. Frank Slater is manager and O. E. Gooding is superintendent.

There are two plants at Brighton, Mich., about four miles from the town, both owned and operated by the American Aggregate Corp. Plant No. 1 is one of the largest plants in the district and is a dry pit plant. No. 2 is a dredging operation resembling in many respects the other dredging plants of this company.

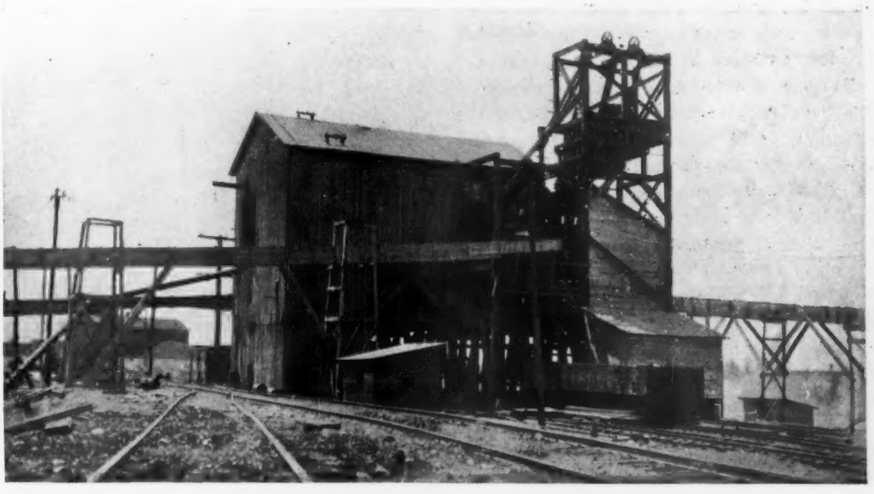
At No. 1 plant the bank is dug by Marion steam shovels, a No. 36 and a No. 61. There are two smaller Erie shovels which are used for stripping, the overburden running about 3 ft. in depth.

Standard gage equipment is used throughout. Ordinary freight cars with hopper bottoms and eight locomotives bring in the material. One locomotive is a Davenport, the others Vulcans and Porters. The cars dump the material on a grizzly over track hoppers, from which it is fed to the plant by two 36-in. belts.

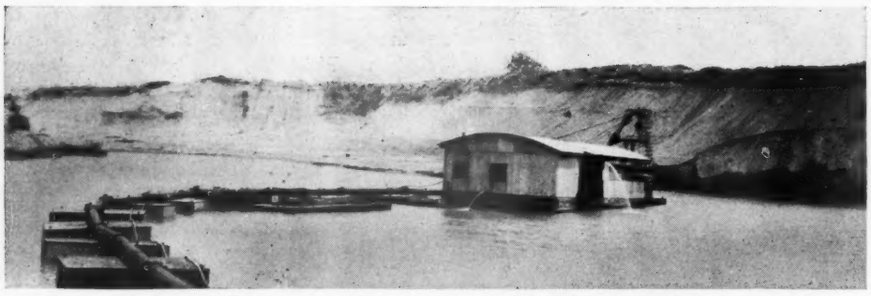
The screening equipment of this plant is unusually ample, as it includes three 60-in. by 24-ft. revolving screens of the Greenville type, two three-deck "Niagara" vibrating

Unloading cars at the track hopper at Plant No. 1 of the American Aggregate Corp. at Brighton

Pumping sand to storage at No. 1 plant of the American Aggregate Corp. at Brighton



No. 2 plant of the American Aggregate Corp. near Brighton, showing the hopper and skipway under construction at the right



The dredge of the No. 2 operation of the American Aggregate Corp. at Brighton

screens and one three-deck "Simplicity" screen. For crushing there are three Allis-Chalmers gyratories, two of them of the McCully pattern, and a 36-in. horizontal Symons disk crusher.

At this operation an excellent method of storing sand has been recently installed, the sand being dredged from the low ground on to which it was run from the plant and pumped to high stockpiles.

The dredge at Plant No. 2 is almost a duplicate of the dredge at the Columbus, Ohio, plant of this company, which was described in some detail in Rock Products for November 13, 1926. The pump is a 15-in. "Amsco," made by the American Manganese Steel Co., driven by a direct-connected 400-hp. General Electric motor. The suction is fitted with a rotary cutter.

The screening and washing plant was being remodeled (at the same time it was being operated) at the time it was visited and a somewhat unusual system of dewatering was being installed. The pump discharge is spread out and turned over gravity screens which take out the water and the sand. The gravel, the oversize of the screens, is sent directly to a large "Greenville" sizing screen, the oversize going to a No. 7½ Gates crusher and a Morgan crusher. The crusher discharge is returned to the same screen by an elevator that keeps it in the regular closed crushing circuit.

The sand and water passing through the gravity screens go to a sand hopper below it and the excess water is taken out by an overflow. There is a chute below the hopper that feeds into a skip running in vertical guides and this skip lifts the sand to the sand screen where it is sized and then sent to the bin. The sand hopper is one recently devised by F. D. Coppock, president of the company.

J. J. Corcoran is manager of No. 1 and No. 2 plants. He was formerly superintendent of the Greenville Gravel Co.'s plant at Columbus, previously mentioned.

A great number of products are made in these parts, as in many of the other plants of this company. The principal ones include 2½-in., 2-in., 1-in., ⅝-in., ½-in., and ¼-in. to 1 1/10-in. gravels; a concrete mix which includes all but the ¼-in. to 1 1/10-in. sizes; what is known as a "50-50" mix; two grades of sand called "No. 2" and "No. 4" and two road repair materials with and without sand.

A Large Production Trucking Plant

Beside the large plants visited there are several other operations that send material to the market made by the city of Detroit and surrounding towns which could not be visited for lack of time. Some of these are trucking plants and there are two or three in the vicinity of Pontiac which have good sized productions. The only one which was visited, the plant of Foley and Beardsley, has a larger production than some railroad shippers, averaging about 2000 tons per day throughout the season.

This is a new plant and will later be described in detail. It is the third plant which Foley and Beardsley have built and hence it embodies their ideas of what a plant should be to conduct a trucking business successfully.

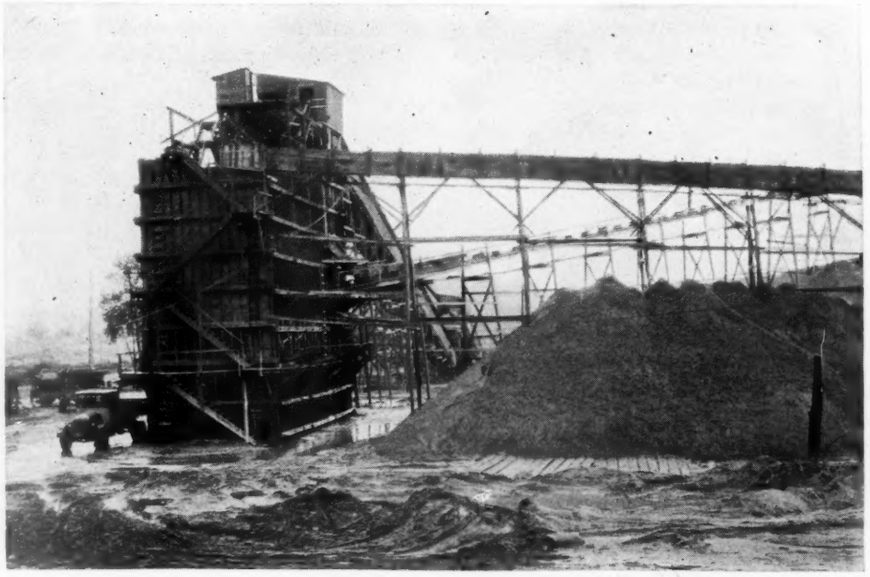
But perhaps the feature that has contributed the most of the success of this operation has come from the study given to delivery by truck. After comparing various types of trucks they finally had a special truck designed for them by the General Motors Co., a six-wheeled affair, that could be loaded to nine tons without passing the legal limit per inch of width of contact between wheel and pavement. These trucks are used with Freunhauf trailers and the combination has cut the cost of delivery 33% below what it was when single trucks were used in the ordinary way.

This company employs from 55 to 60 trucks every day throughout the shipping season, which makes it one of the largest, if not the largest, straight trucking operation in the country.

The plant is a dry pit, the bank being dug by Thew electric shovels and brought in by Plymouth gas locomotives in Koppel 7½-yd. cars. "Niagara" screens are used exclusively for sizing, although the scalping is done in a 14-ft. Stephens-Adamson cylindrical screen. This company also supplied the conveying machinery. The oversize is crushed in an Allis-Chalmers No. 5 crusher and the discharge is sent back to the scalping screen. Sand is settled in a bin and the overflow is classified in the long sand flume of the type developed in the plants at Oxford.

Impressions of the District

Summing up the impressions gained from this visit, it would appear that only the large scale production plants can hold their own in a district where competition is so keen, unless they are trucking plants delivering in a limited area. And this seems to be the case in and near the larger centers of population throughout the country. The large tonnage plant was a natural development which came from the necessity for filling large orders. In the same way combinations of plants are a natural development where sales are made throughout a district in which there are many lines of railroad and a number of outlets are needed. But it appears that the well managed trucking plant of even



The plant of Foley and Beardsley, which is a trucking operation producing 2000 tons daily

small production delivering directly to the job offers an advantage to the purchaser in speed and convenience that enables it to hold its own.

Sand and gravel is probably as cheap in the Detroit district as it is anywhere. Of course the average is brought down pretty low by the low price of sand, which is produced to considerable excess in producing gravel. This has worked decidedly to the disadvantage of producers as the customer who knows that sand and gravel are produced together cannot see why such a big difference in the prices should exist. The present tendency is to store sand as much as possible, relieving the plant of the burden of shipping it at any price in order to get it out of the way.

A considerable part of the production is sold through dealers and this in part accounts for a low plant price. Competition from other materials is strong, especially crushed stone. Detroit, being a lake port, is a market for several quarries that ship by boat, and this competition is increasing. A good deal of crushed stone also comes in by rail from the quarries of northwestern Ohio.

In the main the quality of the material produced is excellent. The deposits are all of glacial materials and the only inpurity of importance is a loosely consolidated sandstone which is locally called "soft rock." The highway department limits this strictly and inspection on this point is said to be rigid. But from the deposits described above, it is said that the percentage of soft rock in the finished gravel does not exceed 1%.

Sand is of excellent quality and well graded. The standard device, or what was considered the standard device is the long sand flume. By adjusting baffles in this flume so as to make pockets of different widths and depths the sand could be graded to almost anything desired. But equally good results appear to be obtained with the somewhat simple sand-settling devices used in newest plants.

The country around Detroit is largely of gravel hills interspersed with many lakes and there is probably gravel enough for years.

Rock Asphalt Development in Missouri

T. L. THOGMARTIN AND SONS, of Fort Scott, Kan., have the contract for stripping the asphalt field one-half mile north of Deerfield, Mo. There is 80 acres of the rock asphalt, but not all of it will be stripped at this time.

Mr. Thogmartin stated that mining of the asphalt will start at once. Thomas H. Bellrose, a chemist and research engineer, has put down 1000 test holes in the asphalt field. He predicts a great demand for the Deerfield product, which has been endorsed by Missouri highway engineers.—*Ft. Scott* (Kan.) *Tribune.*

American Engineering Standards Committee to Speed National Standardization

Procedure Has Been Simplified

EXTENSIVE REVISION of its rules of procedure to speed industrial standardization work on a national basis is announced by the American Engineering Standards Committee. The chief object in broadening the procedure has been to make it so flexible that it may easily fit all of the varied conditions to be met in the wide range of industrial subjects covered by the committee's work. The revision is based upon the experience of the Standards Committee during its nine years of activity as a national standardizing body.

Three important changes are made in the procedure. Heretofore each sectional committee—essentially a joint committee composed of representatives of the various groups interested in the particular work in hand—has acted under the administrative support and direction of one or more of the interested bodies, who are termed sponsors. A sectional committee may now operate autonomously, reporting directly to the A. E. S. C.; or it may act under sponsors as before. The second change recognizes "proprietary" standards and makes possible the revision of such standards within a single organization on condition that it be shown that a standard is acceptable to the groups concerned. This method is particularly applicable to highly specialized fields in which the standard of an organization has already achieved a position of recognized eminence. The third change provides for very simple cases. The approval of standards under such cases is based upon the action of a conference followed by written acceptances of the interested groups.

The revised procedure states that the different methods are founded on the principles that the basic test to be applied in all cases is the fact of the assent, affirmatively expressed, of the groups having substantial interest in the standard. Such groups have an inherent right to representation on the body dealing with the subject matter of the standard, but it is not essential that this right be exercised.

Steps in Development of a Standard

The steps in the development on revision of a standard by a sectional committee are:

1. Standardization proposed by responsible body.
2. General conference called by A. E.S. C. to consider proposal and to decide whether the work shall be done; if so, whether the sectional committee shall operate under a sponsor or autonomously.
3. Recommendation of conference acted upon by A. E. S. C.
4. A sectional committee is organized.
5. The make-up and personnel of sectional committee approved by the A. E. S. C.
6. Standard drafted by sectional committee.
7. The draft standard published or circulated for criticism.
8. Proposed standard approved by sectional committee by letter ballot.
9. Proposed standard approved by sponsor, if there be a sponsor, or formally endorsed by at least one co-operating body if the sectional committee is autonomous.
10. Standard approved by A. E. S. C.
11. Standard published by sponsor, or by the A. E. S. C. is sectional committee is autonomous.

Steps in Approval of Existing or Proprietary Standards

1. An existing or a proprietary standard submitted to A. E. S. C. for approval by a responsible body.
2. Investigation of facts regarding consensus through A. E. S. C. agencies; or the development of the acceptability of the standard through a representational committee.
3. Standard approved by A. E. S. C.
4. Standard published.

Steps in the Development of a Standard by General Acceptance

1. Standardization proposed by a responsible body.
2. Survey of field made and draft standard produced by working committee.
3. Draft standard considered by general conference.
4. Proposed standard formally accepted by groups concerned.
5. Standard approved by A. E. S. C.
6. Standard published.

The governing authority of the American Engineering Standards Committee is at present vested in 63 men representing 36 national organizations, industrial, technical and governmental. About 350 national organizations are officially co-operating in the work, with 2100 individuals engaged on various committees. Up to the present time, 111 national standards have been approved, and 164 additional projects representing almost all branches of industry are under way.

Technical and Economic Problems of the World's Cement Industry

A Survey of the Cement Industry of the World

By Dr. C. R. Platzmann
Consulting Engineer, Hamburg, Germany

ALTHOUGH the cement industry of the world can look back on more than 100 years of its existence, it is, nevertheless, only since the beginning of the twentieth century that it has witnessed tremendous development, which has kept pace with the development of modern industry and with the concentration of large masses of population into cities. This development was suddenly interrupted in 1914. Up to that time Europe and the United States were the main producers of this increasingly essential structural material; the conditions now arising excluded Europe from participating in supplying the demand. This deficiency on the world market could be only in part made up by the United States.

The natural outcome was that wherever European cement had been used previously, national industries were now organized, which were capable of filling the demand of their countries with respect to quantity and quality. To understand this problem thoroughly, one should be familiar with the normal development of a cement mill. The three important factors are: Deposits of raw materials, supply of fuel and good market conditions, the latter including possibilities of export, much coveted during the first decades, and resulting in the location of many plants along the waterways. All of these items underwent important changes during the years 1914 to 1918. Europe could not take part in the exports and what it was able to produce was consumed by the demand created by the war. This reduction of output did not apply only to the Central Powers, for even in England production fell from 3 million to 1½ million tons a year. A sensational drop was experienced by the Russian cement industry, where civil war contributed to the chaotic conditions, which completely destroyed an industry prosperous in 1914; production fell from 2 million in 1913 to only 9450 tons in 1919. In Germany this drop was about 5 million tons in 1919. Even the United States, barely touched by the war, did not succeed in raising production, but registered a drop of 4½ million tons during the years 1913 to 1918.

On the other hand, countries which did not feel the effects of the war, countries, which up to that time imported their cement from Europe, now began to show a development in the cement industry. Japan, which in 1913 manufactured only about 600,000 tons of portland cement, was capable of producing 2½ times as much in 1920, and has since boosted its production to almost 3½ million tons. British India, which up to the war had no cement industry of any significance, manufactured 264,000 tons in 1924, while Australia reached a capacity of over one million tons in 1926. The relation of actual output to capacity, which latter is in general 30 to 40% higher than the former, can be seen from the table, which contains data for 35 countries.

New plants were created all over the world during the war and the first years that followed. Such plants appeared in Argentina, Uruguay, Ecuador, India, Siam, Sudan, South Africa, the Philippines and in the Hawaiian Islands. Their foundation was made possible by the cut in European exports.

The reduction of export possibilities was not affected by the tremendous growth of the American cement industry, which in 1927 reached a production figure of 27 million, for the United States, with its fantastic development of technique and industry and the large area covered, has never been an active export country, considering its actual

PRODUCTION OF CEMENT IN 35 COUNTRIES (1896-1927 INCL.)—UNITS OF 1000 METRIC TONS

Country	1896	1904	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927
Belgium	.....	.....	1,350	1,511	.....	.....	.....	.....	.....	.....	600	.....	1,800	2,000	2,100	2,200	2,300	.....
Brit. Columbia	.....	.....	.....	.....	.....	.....	.....	.....	.....	50	50	50	50	63	.....	.....	.....	.....
Brit. India	.....	.....	.....	.....	0.945	18	39	74	84	87	91	133	148	235	264	.....	.....	.....
Bulgaria	.....	.....	.....	.....	3	10	14	21	16	8	15	26	30	33	55	.....	.....	.....
Chile	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	108	.....
China	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	447	.....
Cuba	.....	.....	.....	.....	.....	.....	.....	.....	.....	52	77	73	83	100	.....	.....	.....	.....
Denmark	100	433[1]	400	495	.....	.....	383	115	178	197	251	312	470	655	.....	590	569	.....
Germany	2,236	3,621	6,630	7,500	7,149	5,066	3,001	3,777	1,919	1,791	2,500	4,000	4,800	3,495	4,190	5,807	5,900	7,713
England	.....	2,877	2,667	3,000	.....	.....	.....	1,500	.....	.....	2,333	.....	3,000	.....	3,143	.....	.....	4,120
Esthonia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	46	70	.....	.....	.....
Finland	.....	.....	.....	.....	66	67	.....	.....	.....	.....	83	72	100	165	170	.....	.....	.....
Greece	.....	.....	.....	25	.....	.....	.....	.....	30	.....	.....	28	37	36	55	60	86	.....
Italy	.....	.....	847	.....	1,043	.....	.....	.....	.....	.....	.....	.....	1,300	1,300[2]	.....	.....	.....	.....
France	.....	1,240[2]	.....	1,400	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2,500	.....
Japan	.....	.....	635	632	736	644	795	775	1,130	1,083	1,550	1,667	1,867	1,967	2,530	2,580	3,068	3,436
Canada	.....	415[4]	583[4]	1,481	1,455	859	.....	795	.....	769	1,083	1,077	1,075	1,281	1,294	1,353	1,451	.....
Latvia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12	12	12	12	.....
Luxemburg	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50	46	65	.....	.....	.....	.....	.....
Mexico	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	95	.....	.....	.....	.....	.....
Dutch India	.....	.....	.....	.....	36	33	.....	37	.....	.....	.....	45	61	78	81	85	97	.....
Norway	12	22	.....	.....	.....	.....	183	.....	170	.....	.....	.....	250	.....	.....	.....	.....	.....
Austria	.....	1,167	1,767	1,400	900	563	.....	520	260	95	.....	400	280	.....	370	.....	.....	.....
Poland	.....	.....	332	450	308	447	.....	.....	.....	194	231	342	459	505	350	526	557	770
Portugal	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	80	80	80	80	.....
Rumania	.....	.....	144	135	155	133	60	.....	.....	70	110	132	153	205	183	226	.....	.....
Russia	198[5]	617	1,667[6]	2,029	.....	1,890	1,206	.....	234	9.45	20	100	.....	375	731	1,500	1,667	.....
Sweden	75	144	330	390	278	306	347	281	227	236	281	242	360	386	404	444	.....	.....
Switzerland	133	197	500[7]	735	437	294	470	.....	.....	.....	.....	.....	.....	900	.....	.....	.....	.....
Spain	.....	185[8]	.....	512	.....	.....	537	.....	.....	.....	.....	540	900	.....	.....	.....	.....	.....
Tonkin	.....	.....	.....	50	56	73	.....	86	.....	.....	.....	.....	116	111	.....	.....	.....	.....
Czecho-Slovakia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	410	.....	.....	.....	.....	1,500
Hungary	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	240	290	440
United States	257	4,417	13,740	15,350	14,705	14,319	15,253	15,469	11,847	13,463	16,821	16,474	19,132	22,910	24,893	26,867	27,341	29,124
Turkey	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	65	70

[1] 1908. [2] Puzzolani cement included. [3] 1906. [4] 1907: 415,252 t. 1908: 582,660 t. [5] 1893. [6] 1911: 1,395,166 t. [7] 1911. [8] 1900.

To convert metric tons to short tons (2000 lb.) multiply by 1.1023.
To convert metric tons to barrels multiply by 5.8633.

production, and has found it possible to sell its cement mostly on the domestic market, where favorable conditions were heightened by the development of automobile traffic, which brought the demand for cement for road construction alone to nearly one-third of the total production. It seems, however, that even in the United States, at least at the present moment, the market conditions have reached their saturation limit, for the difference between output and capacity, which in 1923 and 1924 was only about 4½ million tons, rose in 1926 by about 50%. This fact does not exclude such local conditions, as in eastern Germany, where the demand for cement is still greater than the supply, so that new plants could be operated successfully. However, the marked effort made at present in the United States to cut imports of European cement testify that in general the market has reached its limit of absorption.

Market Conditions in Europe

European conditions require considerably more thought at present. The fact that the German cement industry, which during the past year has succeeded in equaling its pre-war production for the first time, exports about the same quantities of cement as it did before the war, is no proof that it has regained its export markets. Cement export has become a poor business and can be justified only by the consideration that a market must be found for the cement manufactured if the plants are to work economically, i.e., the cement must be sold at any price. A typical instance is the cement export to Holland. Thus far Holland has had no national cement industry, although a plant is to be installed at Maastricht during the present year. It, therefore, became a field for competition between the German and the Belgian industries. This competition on the Dutch market resulted towards the close of the past year, in German cement being sold at half price in Holland. The recent Belgian-German convention has regulated the supply of Holland, so that the difference in price of German cement on the domestic and on the Dutch markets has been reduced. In spite of this, one ton of German cement in Holland sells for $7.64 to $8.04, while in Germany it sells at about $10.85. Similar conditions prevail on the Brazilian market.

Further complications are produced by the fact, that countries which have organized national industries during the last ten to fifteen years, are not satisfied to provide for domestic demands alone, but wish to participate in the exports, permitting the capacity of their plants to grow beyond domestic requirements. This can be observed in Poland as well as in the Far East, in China and Japan, and it will not be long before Australia will appear as a competitor on the world market. India, though possessing a cement industry, is still an import country, yet the near future will see a change here as an effort is made to cut European imports, namely from England, by imposing a tariff. The same conditions are noted wherever a cement industry is established. The capacity does not remain limited to domestic demands. A country has hardly made itself independent from imports, when it begins to export cement. Yet the cement industry shows a specially pronounced need of working to full capacity due to the high fixed charges and the relatively low proportional charges. It must seek by all means to run its plants at capacity. The natural consequence is that the importing countries have become the place of a competitive struggle of the bitterest nature between the exporting countries, with resulting fall in prices. In spite of the cut in prices, the only two countries which may be said to utilize their capacity are Japan and the United States, the former by about 81% and the United States by about 70% to 80% of its capacity. A 100% utilization cannot be expected, for this would result in inadequate equipment in times of stress and because a plant must be in a position to rebuild, remodel and extend its installations. This can be achieved only when there is a certain range between actual production and capacity.

European conditions are considerably less favorable. The German cement industry had a production of 7,000,000 tons in 1927, which places it second among the cement producing countries; it has a capacity of 12,000,000 tons, of which less than 60% is being used. The Polish industry has an even less favorable ratio of output to capacity, considering the low consumption of cement per capita of population. The same applies to the Scandinavian countries, Switzerland, Austria, France and England.

What Is the Solution?

The question arises: what can be done to meet the increasing difficulties? It is clear that export possibilities will become increasingly rare and every new plant abroad, though it may mean a desirable contract to the machine industry, reduces the exports so that new ways must be sought for in improving the ratio of capacity to production. Great possibilities still exist in Europe in this connection. European countries are just beginning to follow the example of the United States with regard to automobile traffic. Should it be possible to create the same demand for cement for road construction, as in the United States, the present and the coming difficulties might be solved. The actual consumption of cement for road construction in Germany is thus far very slight, considering that during the past year only about 5,380,000 sq. ft. of concrete roads were laid. The use of cement for industrial and municipal buildings is so closely related to the development of technique and industry, that no estimates can be made in this connection. On the other hand, the use of cement in rural communities and for residence building is still so low that it offers possibilities, particularly when the tendency toward mechanization of house building is taken into account, when cement slabs acquire an advantage over brick. The prerequisite of extensive use of cement for house building is a concrete, which, retaining its great advantages of strength, will present no disadvantages of poor insulation, will be soundproof and will permit the driving of nails. In this connection greater importance should be attached to efforts to produce the so-called "cell" or "gas" concrete, as the use of slag concrete is limited to localities where it is available in sufficient quantities and is of satisfactory quality. The need of house building is great throughout Europe. It is the task of the cement industry to find those technical conditions, which will make extensive use of cement possible, in as short a time as possible, so that the impending crisis may be averted.

One Method of Control

A further method, which is being followed to a large extent, is that of buying up small plants and stopping operation, while covering the demand by the output of up-to-date plants working at full capacity. While Germany has made use of this method most extensively, efforts in this direction are being made in all European countries (England, Poland, Sweden, Switzerland, Belgium, France, Italy). Even in the Far East, namely in Japan, the large Japanese cement company, the Asano, controls a number of plants to achieve more rational operation and greater utilization of its equipment.

The limitations in the export field must be recognized. Nevertheless, this is not sufficient reason to speak of the poor economic conditions of the cement industry, as long as every effort is made to create further uses of this ideal structural material, which have not as yet been exploited, at least not in European countries.

Pacific Coast Cement Co. Contracts for Power

SEATTLE'S city light department has captured another big contract—that of furnishing current for the cement plant to be operated by the Pacific Coast Cement Co.

The city council in special session passed an ordinance granting the cement company a rate of $2.50 per kilowatt month, based on maximum demand. This is not a reduction of existing rates, councilmen said, but merely change from an annual to a monthly payment basis, the present annual rate being $30.

N. D. Moore, second vice-president of the cement company, has notified the council that with this change in payment basis granted, his company will sign a contract with city light for the plant to be constructed at East Marginal Way and Dakota Street.

City light officials say the the contract will be next to the largest in effect in the Puget Sound district, representing income to the light department of from $50,000 to $150,000 annually.—*Seattle Post-Intelligencer.*

Lime Burning Practice Based on European and American Observations

Part VII.—Wiesloch Plant—Small Mixed-Feed Kilns—Hydraulic Lime

By Victor J. Azbe
Consulting Engineer, St. Louis, Mo.

ONE SHOULD NOT get the impression that all German plants are large and elaborate. There are many other small ones; an example is the Wiesloch plant of R. Hessler near Heidelberg, the famous German university city.

The kilns employed in this plant are of rather small diameter, 7.9 ft., and have a height of 26 ft. With six of these kilns a surprising amount of hydraulic lime is made —150 tons per day—and the kilns were blown only part of the time; for both day and night operation a capacity twice as great is claimed. The claim was also made that with good coke the ratio was 7 to 1, and with coke breeze 4½ to 1 is obtained. These figures are so high, considering the size of the kilns, that I am very much in doubt of my German employed in asking questions.

Fig. 38. Pan conveyor carrying stone to the breaker at the Wiesloch plant

Of course the lime is of the hydraulic type with a composition of:

Calcium oxide	56%
Silica	15%
Alumina	8%
Iron oxide	2%
Magnesina	1%
Sulphur trioxide	0.6%
Loss on ignition	15%

The heat requirements for such limestone are less and the readiness with which it is burned is greater than for pure limestones.

The kilns are drawn twice a day, the lime being dumped on the floor, then slowly pulled into a pan conveyor, which carries it to the breaker (Fig. 38), where it is reduced in size to ¼ in. or less. From this point it is conveyed to very large pits; first, however, a certain amount of water is added. In these pits the lime remains a rather long time, and slaking and disintegration of the clinker particles takes place. Next the material passes through an air separator, the coarser portion being reground, and the whole bagged. This lime is used for both fertilizer and building purposes.

Fig 39 shows the quarry, which is worked in ledges. The stone is dumped into a crude storage bin, rather imperfectly shown in Fig. 40; here it is loaded into cable carts and taken to the plant, a mile distant, by the cableway. At the plant the stone is dumped into the kilns as shown in Fig. 41.

The cableway method of conveyance is quite popular and extensively used at European lime plants, for both very long as well as short hauls. It was stated, that while they are somewhat expensive to install, they are cheap to operate and quite dependable. In this particular case the distance is short. At the operation of the Austro-American Magnesite Co., in Austria, the plant is located among fairly high mountains, far from the quarry, and far from the railroad, and all of the stone and all of the product is obtained and delivered by a cableway system—a distance of eight miles both ways.

The power used at the Wiesloch plant is generated quite efficiently by a locomobile, seldom employed in this country (Fig. 43). The engine is mounted directly on the boiler: there is little chance for condensation; the engine operates on the compound principle; steam is reheated, and everything is thoroughly jacketed, compact, and still quite simple.

For an output of 130 tons per day they employed in all 60 men; due to the location, away from an industrial center, wages are lower than normally, about 14 to 15 cents per hour for ordinary labor. The trained bricklayer, however, gets 30 cents per hour—still far from the American union wage.

Fig. 39. The quarry of the Wiesloch, showing how the stone is worked in ledges

German Mixed Feed Kilns—Closure

Before leaving Germany, Director Urbach, general manager of German Lime Manufacturers Association, was asked for a statement about the mixed-feed kilns they use. The statement is very conservative and does not deal with the best of German plants, some of which have been described, but more with the average type and average per-

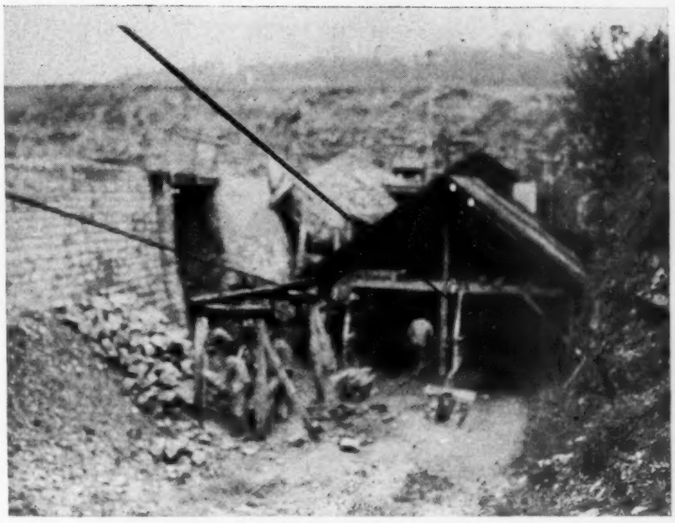


Fig. 40. Quarry stone is dumped into a storage bin, from where it is taken by cableway to the plant

Fig. 41. Stone from the quarry is dumped to the kilns directly from the cableway

formance. Director Urbach's statement follows:

The average heat balance of a shaft kiln in the lime (not the sugar) industry is:

	About
Heat used in burning of lime	40-50%
Loss of free heat in waste gases	30-40%
Loss of chemically absorbed heat	5-10%
Loss through radiation and conduction	5-10%

Individual shafts, exposed to the cooling effect of the outside air over their entire circumference, have conduction and radiation losses as high as 15%. Several closely built kilns reduce this percentage to 5%. The large loss of free heat is caused mainly by suction of secondary air at the stack, which results in a large smoke gas volume at low flue gas temperature. On the other hand, there are kilns, which, however, are less frequent, operated with high flue gas temperatures to achieve highest production. This temperature is generally around 200 deg. C. during normal operation, but may rise to 600 deg. C. when the kiln is charged and drawn only in the daytime. The carbon dioxide (CO_2) content of the waste gases inside the kiln is 36%. Access of secondary air reduces it to 10-15% for kilns with natural draft, and to 5% for kilns with suction. The carbon monoxide (CO) content is generally low and may be entirely avoided by adequate charging and operating of the kiln. The fuel used is coal or coke. The minimum heat value of the coal used is 12,500 B.t.u. To loosen the mass and permit better passage of the air, coarse-size coke is added, particularly at the center of the kiln. The coal consumption under these conditions is about 20% (=1400 W.E. per 1 kg. CaO, a 5 to 1 ratio; 55% efficiency).

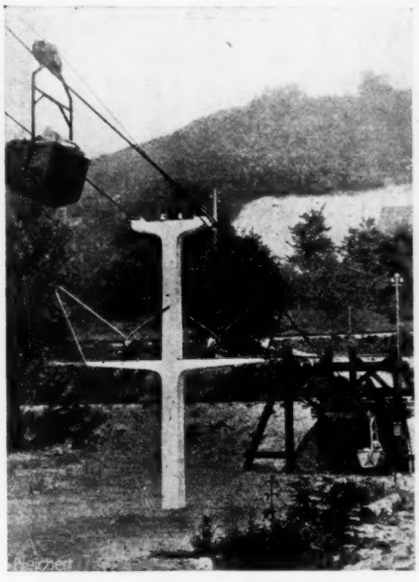


Fig. 42. This cableway carries the stone from the quarry to the crushing plant a mile away

Few German kilns are provided with artificial draft. When this is the case, air blowers are used. Automatic charging and drawing devices are still in incipient development in the German industry. This is caused by their high initial cost and the prejudice of German lime manufacturers against larger quantities of fines in the product, as a result of mechanical discharge. An improvement in construction details of these devices will undoubtedly result in a change of mind.

The interesting points in the above statement are that the CO_2 percentage in the kiln is 36%; if oxygen is 1% and carbon monoxide absent, then one conversant with what these figures mean will immediately know that the fuel ratio is around 5 to 1. The high CO_2 means of course that lime is is made, which means evolution of CO_2. Many an American kiln operates with only 29% of CO_2, corresponding to a ratio of 2½ to 1, just half of that of these German kilns. The dilution of CO_2 with excess air on the kiln top, mentioned by Director Urbach, has no great bearing on kiln efficiency. What counts is what comes out of the kilns.

A waste gas temperature of 200 deg. C., which is only 380 deg. F., is also very good and further proves that the kiln is absorbing the heat and so must be making the lime. Of course, American kilns also record this low temperature immediately after charging, but in the morning following many a kiln has a top temperature of 1200 deg. F., and the average temperature for the day will exceed 600 deg. F. This, together with the large amount of excess air, causes a great loss of heat up the stack. Adding the heat lost due to the drawing of hot lime, one need not wonder that fuel ratios are often half as good as in German practice.

In England mixed-feed kilns were also studied, and they will be taken up together with the other English kilns in a later article. The English have very few kilns for burning chalk; kilns part mixed-feed and part direct-fired; kilns with a shaft 40 ft. high, 10 ft. wide and 50 ft. long; kilns located in series of four, in one of which air is preheating and lime-cooling, in the next lime burning, and in the third, lime heating and gases cooling, and at the same time the fourth is being emptied or charged while the gases pass from one into the other.

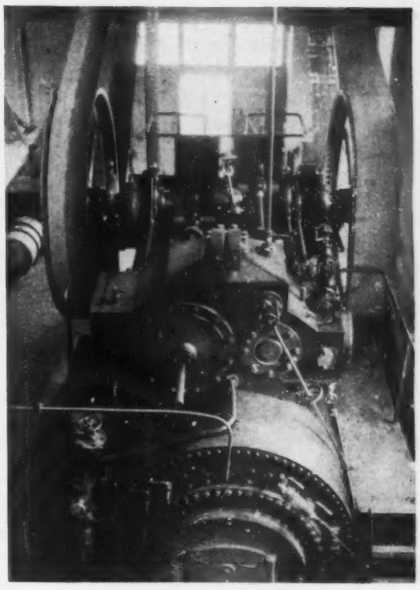


Fig. 43. Power for the plant is furnished by this locomobile

(To be continued)

Scientific Merchandising of Crushed Stone Concrete Aggregate

Proof That a Superior Quality Product and an Engineering Knowledge and Service Are Appreciated

THE RIVER PRODUCTS CO., Iowa City, Iowa, sells crushed limestone aggregate at prices which are often 40% or 50% above those of material offered by competitors. The buyers are glad to pay the difference, too. The stone goes through no special processes and is nothing more than a good, hard Devonian limestone that might be matched in many quarries of the United States. The reason why the extra price is obtained is because it is exactly what the concrete engineer wants and because of the service that goes with the stone. The business is one of the best examples of scientific merchandising to be found in the rock products industry.

Stanley M. Hands, the general manager of the company, holds two engineering degrees from the State University of Iowa and had a considerable experience as an engineer in California and in Iowa before he went into the stone business. Long before the water-cement ratio theory was published he had observed that excess water had a bad effect on concrete strength and that grading had much to do with the amount of water which was needed to make a workable mix. He preached and practiced these things for some time before the publication of the famous Bulletin No. 1 of the Lewis Institute. When that appeared he had a chance to put its teachings in practice both to his own benefit and that of his customers.

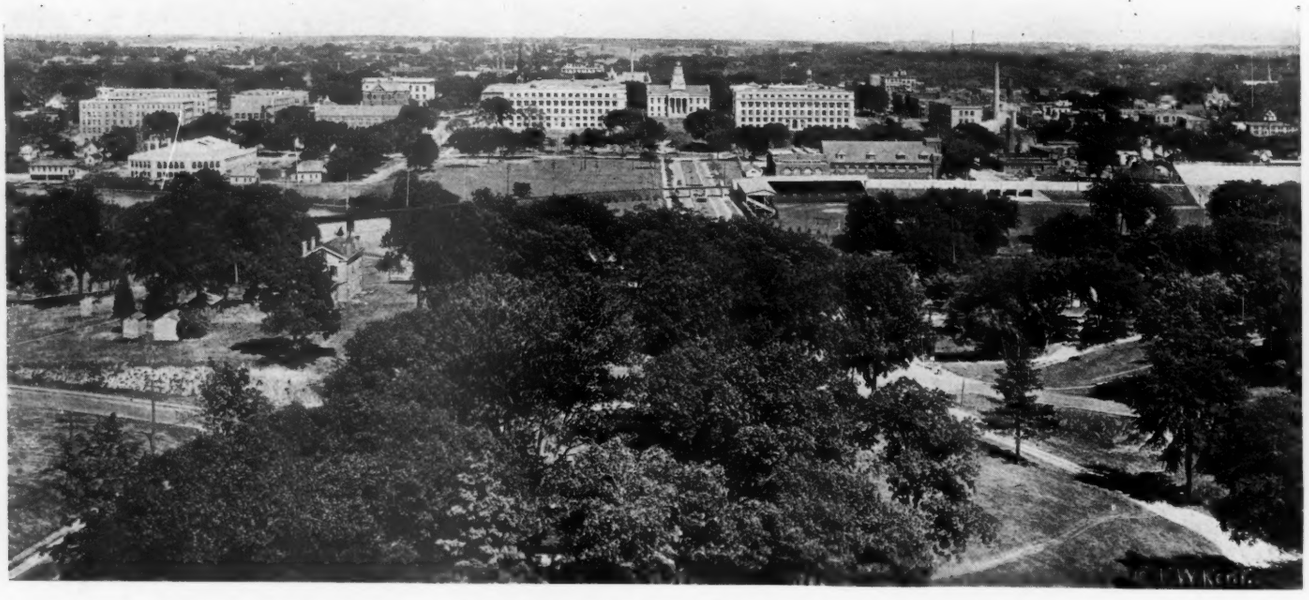
Applying Engineering Knowledge

He had left engineering work some time before and gone into the aggregate business, opening a quarry on the Iowa river about four miles from Iowa City. The ledge had never been worked before, so he sampled it thoroughly and had the samples analyzed before beginning work. The report from the samples was that it was a high-grade high-calcium stone containing 98% $CaCO_3$ and less than 1% of SiO_2. This was important, as he had a market for some flux stone. The physical characteristics showed that the stone would make an excellent concrete aggregate, which was even more important from his point of view.

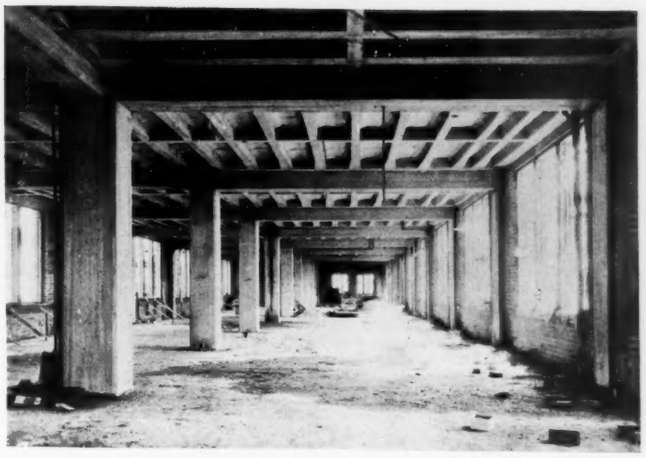
The State University of Iowa is at Iowa City, and it contemplated erecting a group of medical buildings to cost about $5,000,000. Concrete was selected as the material and Mr. Hand, who had been talking scientific concrete for years, found sympathetic hearers in the university authorities who had charge of the construction. He offered to design a concrete mixing plant, with arrangements for batching the aggregate by weight and controlling the water, if he was given the contract for the coarse aggregate, and his offer was accepted. The nearest competitor offered ¼-in. to ¾-in. stone (the size most used in the reinforced concrete work) at 85c f.o.b. plant, which with an 85c freight rate and a 40c hauling charge made the stone cost $2.10 on the job. Mr. Hands' bid was $2.35 on the job or $1.75 at the quarry, and it was accepted.

A clause in the contract read that if more than 1.35 bbl. of cement per yard was needed to make 2000-lb. concrete, then the price of stone would be adjusted to pay for the extra cement needed. But as the concrete tested around 2800 lb., this clause was forgotten. Other advantages obtained by the contractor were a lessened labor cost, 58c per cu. yd. instead of the 65c that was figured, and the ability to strike the forms three to five days sooner than was the usual practice. These savings were the result of greater workability and uniformity than had been anticipated. The contractors made more money than they had expected to make and were thoroughly "sold" on the advantages of scientifically graded aggregate.

Mr. Hands says that credit must also be given the City Sand Co., of Iowa City, for supplying the sand wanted. This company



The group of buildings in which the River Products Co. aggregate was used



Hospital interior which was finished so well that plastering was found unnecessary

Autopsy arena in the hospital where scietifiically combined aggregate made the smooth concrete shown

put in sand separators and made other arrangements so that it could classify sand to give it a fineness modulus of 3.10. The fineness modulus of the crushed limestone was held constantly at 6.80.

Two more buildings of the medical group followed, a hospital and a central heating plant. By this time (in 1926) the Blaw-Knox "inundator" had been placed on the market and its use was written into the specifications for these buildings. Mr. Hands was glad to see it adopted, as he had found it required considerable work and constant supervision to control the water content of the mix without it. The same batching and mixing plant that he had designed was used, plus the inundator. At the contractor insisted on stock-piling the aggregate, the labor saving was not so pronounced, but the use of the inundator accounted for an increase of about 10% in the amount of concrete mixed, 1150 sacks instead of 1050 sacks of cement being mixed daily. The concrete tested about 200 lb. higher than on the first job, and Mr. Hands credits the inundator with this increased strength.

Guaranteeing His Product's Product

In the job for the central heating plant, Mr. Hands made a contract for the coarse aggregate with the general contractor that is believed to be unique. It was a straight-out-and-out guarantee of the required strength and impermeability of the concrete. The job had to be waterproof because a part of a reservoir was below the river level and contamination from seeping in of river water had to be avoided. The grading of the aggregate was carefully worked out and the workability somewhat improved. The job was satisfactory in every respect and Mr. Hands and the River Products Co. had now established a real reputation.

Contractors are willing to pay his price because they are assured of a *uniform* quality and grading. And there is no secret about the way in which this uniformity is secured. It is done by having the plant arranged to add more or less fines in the crushing, and of course by constantly inspecting the product to make sure that the required fineness modulus is maintained. The means by which the fineness is controlled is very simple: a part of the oversize of the first screen is sent to a Universal jaw crusher set to about a ¾-in. opening, and the proportion going to this crusher is changed as the product shows that more or less fines are needed.

The quarry and crushing plant of the River Products Co. are in no way unusual. The face is 38 ft. high and the stone is very free from seams. Holes are put down 2 ft. below the quarry floor with an Armstrong well drill, and are given broken loads, the powder being placed in three or four equally spaced loadings. As the shovel dipper and the primary crusher are rather small, a considerable portion of the rock, perhaps 10%, needs secondary drilling and shooting, which is done with Ingersoll-Rand jackhammers furnished air by a small Ingersoll-Rand compressor.

An Ordinary Quarry and Plant, But Care in Operation

An Erie shovel with a ¾-yd. dipper loads the rock into 6-yd. "Western" side-dump cars, that are drawn to the plant by an 8-ton Plymouth gasoline locomotive. The company has two Plymouth locomotives, the other, weighing 12 tons, being used to handle cars on the company's track, 1½ miles long, that connects with the Rock Island and the Cedar Rapids and Iowa City railways.

The primary crusher is a No. 7½ Allis-Chalmers. The crusher discharge goes to a "composite" elevator with an American Manganese Steel Co. chain and buckets of local make. The discharge of this elevator goes to a 48-in. screen, 16 ft. long, which is changed according to the material that is to be made. The oversize of the screen is split between a No. 5 Allis-Chalmers and an 8x36-in. Uni-

One of the gasoline locomotives used for hauling stone from the quarry and finished aggregate to the railroad

The quarry of the River Products Co. at Iowa City is practically free of seams

The 3/4-yd. shovel at work in the quarry

versal jaw crusher, set to about ¾ in., and it is here that the fineness modulus is regulated, as has been described. The discharge of both secondary crushers is returned to the screen by the elevator mentioned.

The plant does not usually make a number of separate sizes, but three distinct graded materials. These are: Paving stone, which is 2¼-in. and finer; stone for bridge work, which is 1½-in. and finer; and aggregate for general constuction, which is 1¼-in. and finer. All these are properly graded and are free from material below ¼-in. Some special sizes are also made on order.

The material below ¼ in. sells as agricultural limestone. Recently a portion has been screened into special sizes, the finest portion being sold to mix in stock feed and the remainder as chicken grits and as special aggregates.

It will be seen from the above that the special quality which the product of this plant has is *uniformity*. It costs money, as every producer knows, to maintain a uniform grading in the product of a plant, but it is evident that the contractor who understands this is willing to pay for it.

Mr. Hands said, when the notes for this were being made: "I hope you can make a story out of this that will interest individual producers, but I hope even more that it will help the industry to appreciate the work A. T. Goldbeck is doing, and also the real need for laboratory investigation. Without laboratory work the concrete industry would never have progressed, and as it stands we are only at the beginning of the investigation of aggregates that should be made."

Adsorbed Films on Sand Grains

AN interesting paper presented at the December, 1927, Asphalt Paving Conference held in Atlanta discusses the effect of films of mineral substances on the surfaces of grains of sand used as aggregates, especially in bituminous paving mixtures. The author, A. W. Dow, points out that many mineral particles are covered with films of colloidal mineral matter in the gel state. The most familiar example is the reddish film of iron oxide found on very many sands, but the author says that there are other films, some of which are invisible even under a microscope. Nevertheless, the existence of such films can be proved and it can also be proved that they have a very considerable influence on the behavior of the grains so coated when such grains are used as aggregates.

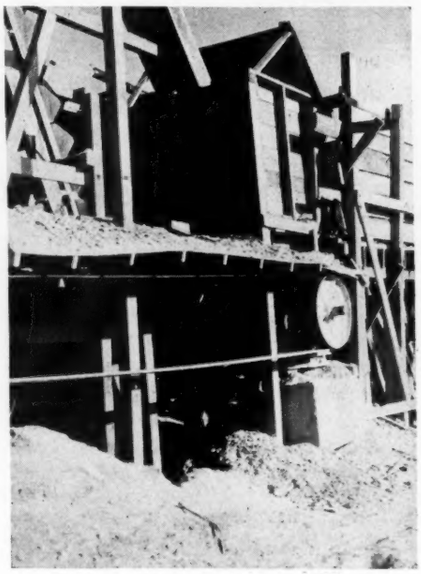
Adsorption varies with the surface exposed but it can take place even where the surfaces exposed are fairly large as compared with colloidal division. Mr. Dow tested fine sands between 50 and 200 mesh by pouring 0.5% solution of asphalt cement in carbon bisulphide through a column 50 cc. high and obtained the following results:

Material	Adsorptive value
Granite	7.0%
Feldspar	6.5%
Kentucky rock	9.5%
Quartz	3.5%

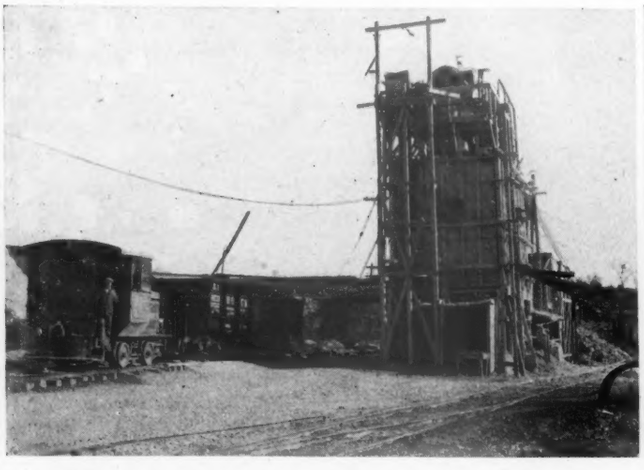
The absorbed films first referred to adhere very closely to the surface but are worn off by the action of wind, water and chemical agencies. Differences among sands may be accounted for in part by the differences in adsorptive value.

Mr. Dow closed his paper by saying that he did not consider the present knowledge of absorptive films sufficient to permit them to be considered as a factor in paving work. It is of interest, however, in that it is a possible explanation of some freak mixtures that have been noted.

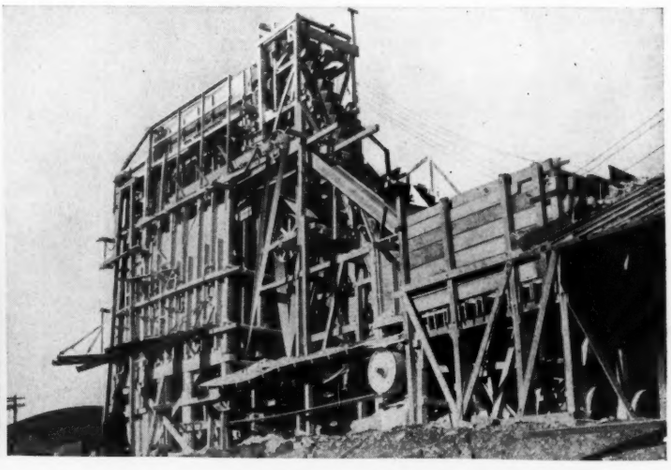
It is also possible that such films may have an influence on the behavior of certain sands used as fine aggregates in portland cement concrete. The explanation of the results found by the Maine Highway Department in testing granitic sands and sands containing iron may possibly depend in part upon adsorptive phenomena. If it can be determined that the differences found in such tests are attributable to these phenomena, a real step forward will have been made.



Jaw crusher at the River Products plant which regulates the grading of the product



The plant of the River Products Co. and one of the locomotives hauling stone to the railroad



Side view of the River Products Co. crushing plant near Iowa City

Digest of Literature on Nature of Setting and Hardening Processes in Portland Cement

Part III.—The Colloid Hypothesis

By R. H. Bogue

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THE FIRST DEFINITE CONCEPTION of the hydration and hardening of portland cement as a colloid chemical process was published by Wm. Michaelis, Sr.,[21] in complete form, in 1906. This master of the art of cement manufacture regarded portland cement as consisting essentially of "alite," which he believed to be:

$$(3CaO{\cdot}2SiO_2 \pm 3\ CaO) + (3CaO{\cdot}2Al_2O_3 \pm 3CaO.)$$

He did not believe that $3CaO{\cdot}SiO_2$ existed, but instead an isomorphous mixture of CaO and $3CaO{\cdot}2SiO_2$ with $3CaO{\cdot}2Al_2O_3$. The amount of the aluminate depended on the percentage of Al_2O_3 in the raw mixture. In addition to this, there was also believed to be present "celite" which Michaelis regarded as consisting of dicalcium compounds.

Michaelis conducted a considerable number of experiments from time to time extending over a period of more than 45 years beginning in 1864, which culminated in the development of a theory that the hardening and water resistance of cements were due almost exclusively to the formation of colloidal hydration products. In presenting the final form of that theory it will be well to outline the ideas and experiments which resulted in the colloid hypothesis.

Silica and Calcium Silicates

It was reported by Michaelis that hydrated calcium silicate and hydrated calcium ferrite are very difficultly soluble in lime water, even if much diluted, and that hydrated calcium aluminate is likewise difficultly soluble provided the lime water is sufficiently concentrated. He showed that amorphous silica reacts energetically with calcium hydroxide under favorable conditions up to a maximum basicity of 3CaO to $2SiO_2$. To demonstrate this, Michaelis placed a mixture of "silica hemihydrate" and calcium hydroxide in a paper tube and added water. There was observed an immediate rise in temperature of 8 deg. to 12 deg., which was attributed to surface adsorption of water. Following this Michaelis claimed that combination took place, and resulted in the formation of a "hardened body, possessing great strength."

Calcium hydroxide was found to be precipitated from saturated lime water by the addition of colloids "by adsorption of a certain quantity of water needed for dissolving the lime." The $Ca(OH)_2$ precipitated usually as microscopic hexagonal crystals, but "amorphous lime may be precipitated on the surface of the colloids and imbedded in them."

A bulky precipitate of "hydrated calcium silicate" was found to be formed instantaneously when lime water was added to "silica dissolved in water" in the ratio of 2 or 3 mols CaO to 1 of SiO_2. The strongly compressed gel contained five times its weight of water, and dried out to "a very solid and hard mass, which equals in strength hardened portland cement." A formula was given this material, $5CaO{\cdot}4SiO_2{\cdot}4H_2O$, but later was withdrawn since repetitions of the experiment gave somewhat variable results. The dried mass was found to retain its hardness and solidity even when exposed to "white heat."

Hydrated calcium silicates such as the above were found to be formed whenever any form of silica, in a sufficiently finely divided state, was brought in contact with calcium hydroxide. Even powdered quartz sand reacted when pressure was applied. Some decrease in volume occurred on drying the hydrated calcium silicates, but this was found to have no harmful influence on the strength, but even made for a stronger product.

Magnesia and Magnesium Silicates

The hydrated magnesium silicates were found by Michaelis to be analogous to the hydrated calcium silicates except that they were much more stable compounds. The barium and strontium silicates were not analogous, as they formed only crystalline products. "The barium cements therefore prove that hardening takes place without swelling or gel formation, but they also prove that without gel formation we have no hydraulic hardening."

The failure of Michaelis to obtain crystalline hydrated silicates of calcium and magnesium is attributed to "absolute insolubility in water." Hence they always appear as amorphous colloid material. It was therefore established, according to Michaelis, that the hydrated silicates of the hydraulic cements are never crystallized and that silica combines in aqueous solution with lime up to the ratio 3CaO to $2SiO_2$.

Concerning magnesia, Michaelis argued that it could not be present as uncombined MgO unless the MgO content of the mixture exceeded 6%. The reasons given were that "magnesia clinkers and fuses with alumina and iron oxide even more readily than lime, and a mixture of lime and magnesia is certainly apt to fuse even more easily than each of these two bases separately." By observations on the color changes and the fluxing action Michaelis concluded that the magnesia "is contained in the cement clinker principally as dimagnesium ferrite; if the magnesia exceeds 2%, magnesium aluminate may be formed in addition to the former, and only after all of the iron oxide and alumina have combined with the magnesia available for this purpose can uncombined magnesia exist." He adds that no combination of silica and magnesia will be formed because of the strong affinity between the silica and lime. Many additional experiments, together with the experience of the industry that MgO could be entirely neglected in calculations of cement raw mixture, are cited as further proof that no silica is combined with magnesia. The solubility of MgO in water is given as 1 in 55,000, and in order to bring about gel formation a much greater concentration is required. Hence hydrated magnesium silicate cannot be formed in the setting of cement. It is concluded that in portland cement magnesia is not equivalent to lime and that in this material magnesia is unable to form hydraulic compounds with the silica because the lime monopolizes the silica. The same behavior which has been hitherto ascribed to the uncombined sintered magnesia, namely, its late hydration and accompanying expansion (100% increase in volume) would likewise apply to magnesium ferrite and calcium ferrite, according to Michaelis, "because the ferrites, if vitrified or fused, are those calcium and magnesium compounds of the cement which are decomposed by water with the greatest difficulty and which hydrate only very late."

Alumina Compounds

As a result of a number of carefully made analyses of hydrated cements, Michaelis concluded that the alumina formed various aluminates, especially $5CaO{\cdot}2Al_2O_3{\cdot}aq.$ and $3CaO{\cdot}Al_2O_3{\cdot}aq.$ He believed that these might also form double compounds with the silicate but did not present proof of this contention. He denied that the setting of cements was

caused by calcium aluminates because in well burned cements these simple aluminates were not present. The aluminates were believed to be dissolved in "alite," which hydrated as follows:

$$6(3CaO\cdot 2SiO_2 + 3CaO) + (3CaO\cdot 2Al_2O_3 + 3CaO) + aq. = 6(3CaO\cdot 2SiO_2\cdot aq.) + 18Ca(OH)_2 + \text{hydrated calcium aluminate.}$$

Michaelis believed that several different aluminate compositions are possible and that the silicate eventually hydrolizes to $CaO\cdot SiO_2\cdot aq$. The formation of the colloidal silicate was found to require but a very small percentage of lime, 3 to 5% being sufficient. The alkalinity of the mixing water was found to be unimportant; the hardening was found to depend only on the concentration of calcium ions in the solution. "The alkalies rather prevent hardening because they form sols with SiO_2 and Al_2O_3; for hydraulic hardening gel formation is the important one. Lime is the necessary gel former."

Application to Portland Cement

The application of all of these experiments to the hardening of portland cement is summed up as follows:

The crystals of calcium hydroxide, hydrated calcium aluminate and calcium sulfoaluminate which are being formed find room for developing in the gelatinous compressible hydrated calcium silicates and partly also in the hydrated calcium aluminates. By their formation they gradually solidify the formerly elastic colloid which, by itself, on drying becomes hard as stone. Therefore, the colloid alone, without further assistance, is able to cement the grains of sand or the crystals imbedded in it, thus acting as a mineral glue (lime water-glass). This mineral glue differs from organic glue inasmuch as it cannot soften again after once having given off its swelling water; it cannot swell again, and keeps its hardness.

This mineral glue, the hydrated calcium silicate, protects the iron in reinforced concrete from oxidation by covering it like a varnish.

The later hardening is due to the gradual giving off of the swelling-water, the progressive hardening of the colloids, the gradual hydration of the celite constituents, especially of the calcium ferrites, and the continual formation of $Ca(OH)_2$ crystals.

The gelatinous hydrated calcium silicates and aluminates (not all of the hydrated calciuma aluminates crystallize) possess the peculiarity of being perfectly waterproof, and therefore we find the inside of all the larger grains of cement in an unhydrated state, covered with a gelatinous film.

Electrolytic Forces

In his last paper, Michaelis attempts to explain the phenomena of hydration more adequately on the basis of the electrical movement of ions and consequent neutralization of charges. He says that by treating portland cement with a large excess of water, lime is extracted from the clinker which may be considered as a lime-saturated solid solution; and "thereby the residue enriched in the acid ingredients, which we call anions or anion-formers, so that the residue can be considered as negatively charged." He then goes on to say, "When the concentration of the lime solution is sufficient, the calcium cations wander to the anions or the two wander to each other, and since combination takes place quickly and the compound is difficultly soluble, then gel formation, follows."

Michaelis believed that "approximately monocalcium compounds" remain after hydrolysis and that thereby the residue is enriched in anions and charged electronegatively, while the cations Ca++, Na+ and K+ are partly or entirely removed from it. As soon as the concentration of the lime water is sufficient, the cations wander to the anions "somewhat as iron filings wander to a magnet" and form the difficultly soluble compounds, especially the hydrated calcium silicate, and separate "as a gel, hydrogel or colloid."

The whole process is illustrated by referring to the several things which take place when a few grains of cement, with the usual 2% of gypsum, are added to an equal volume of water. The mixing water is said immediately to dissolve lime, calcium aluminate, calcium sulfate, alkali silicates and calcium ferrite. There is formed a supersaturated solution of CaO, $3CaO\cdot Al_2O_3$, and $CaSO_4$ which form calcium sulfo-aluminate until all of the $CaSO_4$ is used up. Crystals may also form of calcium aluminate and $Ca(OH)_2$.

The crystalloidal product formed, according to Michaelis, will set and harden, but is never an hydraulic mortar. Water will easily penetrate and soften it. The colloid forces now come into play. "Suddenly the whole saturated solution which surrounds the cement particles coagulates. A gel is formed, and that is the instant when we see the water disappear from the surface of a pat of cement, leaving it dry and dull; or in short when setting has been completed." The hydrogel at first is found to be low in lime and to behave like a gel of silicic acid. However, more lime is taken up by adsorption. The water is soaked up by the interior of the grain in hydrating, and thereby "the hydrogel becomes denser and denser on the surface until finally it is absolutely impermeable to water." This withdrawing of water by the "inner suction" is used as the basis of the argument to explain hardening under water. When hardened in air, the evaporation of the water contributes to the hardening of the gel, but also causes shrinkage cracks.

The later increases in strength are said to be due to "slow recrystallization of calcium hydroxide, calcium aluminate, and calcium sulfoaluminate (if gypsum is still present) from a supersaturated solution; and even calcium sulfate crystallizes in large-faced crystals."

The argument of Michaelis, that gels can form only when SiO_2 sols or electronegative SiO_2 compounds enriched in anions react with lime water of sufficient concentration, would imply that gel formation and swelling are excluded when saturated, electrically indifferent, or even supersaturated lime compounds are treated with saturated lime water. To demonstrate this as indeed correct, Michaelis exhibited:

(1) Samples of portland cement which, after removal of its "excess lime" by extraction with lime water, gave a gel which did not swell in saturated lime water.

(2) "Lime" from Teil which did not swell in lime water.

(3) "Sintered $2CaO\cdot Fe_2O_3$" which, on slaking with saturated lime water for months, hydrated but did not swell nor take up lime. After removing CaO by extraction in water, the product, placed in lime water, showed absorption of lime, gel formation and swelling.

(4) Dusted $2CaO\cdot SiO_2$ which, after extraction with water "so that it was charged with SiO_2 anions," exhibited swelling and gel formation following treatment with saturated lime water.

The hydraulic mortars were not regarded by Michaelis, however, as especially stable compounds. "They represent," he says, "the first compounds formed by the reaction of water on the cement. The permanent state for all hydraulic cements is only reached when all the lime has been changed to $CaCO_3$ and all anions changed to hydrate."

Summary

The colloid theory of Michaelis may be summarized as follows:

The action of water on cement brings about two types of reaction. First the solution of lime, aluminates, sulfates and other compounds of the cement. From this solution there are precipitated various crystalline products, as calcium aluminates, calcium sulfoaluminate and calcium hydroxide. This gives a material possessing some strength, but not at all resistant to further disintegrating action of the water. As soon as the lime water has reached a definite concentration it acts on the calcium-impoverished silicates, through electrochemical forces; and forms the hydrated calcium silicate. Because of the difficult solubility of the silicate it forms a gel which fills the pores of the cement and makes the latter impermeable to water. The gel is soft, but the inner mass of the cement grains eagerly withdraws the water from the gel and in that way the surface becomes hard. The great strength and water resistance of the cement are thus explained as due almost entirely to this gel formation and its drying out by the inner suction of the cement grains.

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(*To be continued*)

Batching Plants for Sand, Stone and Gravel Producers

Construction and Operating Costs and Advantages to Both Retailer and Contractor in Batching at the Yard

By Melvin E. Hartzler
Consulting Engineer, Chicago, Ill.

THIS article has to do with the application of batchers to a retail material yard and not to the general use of batching plants for construction contractors.

The name batchers has been applied to the equipment or machines designed and used for proportioning sand and crushed stone or gravel in order to make concrete to meet an engineer's specifications.

The writer will not go into detail as to how these batchers operate, but will try to explain how it is possible to make a batching plant operate at a profit. In so far as batchers are concerned, there are a number of good ones that may be brought, which will meet most conditions in retail yards. The writer would recommend that these batchers that are now on the market be used in preference to an individual design for a particular yard.

Before making an expenditure for the equipment for a batching plant it is well to analyze the conditions for this branch of the business in the same way that we would analyze the conditions for any other business, to find out:

1. Extent of market.
2. Estimate of units costs of batched materials.
3. How much advertising will be necessary to obtain sufficient business.
4. Location of the batching plant with respect to bulk material yard.
5. Capacity of the batching plant.

To analyze the extent of the market is often no simple matter, for after having made inquiries as to whether contractors will purchase batched materials, and pay anything for this service above the regular price, one is still without accurance of sales. Usually contractors think they can batch materials for less cost than the retailer can. The analysis links with the advertising, and some very effective sales work may have to be done to put over the batched material idea.

Estimate of Unit Costs of Batched Materials

The best manner in which to explain the estimate of unit costs is to give a concrete example which gives an outline of procedure as well as a basis of comparison. Therefore an analysis has been made of a case which is more or less typical.

In the case from which this analysis was made the bulk material yard did not have sufficient ground room to permit placing the batcher in the same yard with bulk material storage without causing interruption and congestion of the bulk business, although the same crane equipment could be used to fill the hoppers of both delivery systems.

Additional ground space required 40x90 ft. at a price of $4 per square foot	$14,400.00
Batchers and batcher bins	2,280.00
Use of locomotive crane already purchased and in use. Prorated	1,000.00
Total into capital account for batcher plant	$17,680.00

In this instance the handling of the cement would still be from the cement sheds as before; therefore no additional amount would be charged to the batched materials for the cement handling. The equipment would be such as to demand only one operator. Thus the operator costs work out as follows:

Interest at 6% on the entire capital account first year	$1,060.80
Depreciation on batchers and bins at 5%	114.00
Depreciation on that portion of the crane that is charged to this work at 10%	100.00
Batcher plant operator for nine months at $120 per month	1,080.00
Crane operator charged to this operator, prorated	650.00
Repairs to crane and fuel, prorated	240.00
Total additional cost	$3,244.80

From a survey made it was estimated that the contractor could pay 40c per yd. for this service and profit thereby, but it was believed that he would not pay over 25c. Therefore, on this basis, a business of 12,977 yd. would have to be done to break even. It was believed that this amount of business could be done and the plant was built and placed in operation one month later than was planned, and a business of 10,900 yd. was done the first year of the plant's operation.

However, it must be admitted that this result was partly due to good fortune. The company secured a large job which it had not anticipated when the batching plant was built, and it was the deliveries to this job that brought the first year's business to the estimated amount. In other cases the first year's business might show a loss, as it takes time to establish such a service and get the contractors to feel that

Two batchers on separate bins in the yard of a building material supply company in Chicago

it is wholly reliable and dependable.

Details of a Complete Batching Plant

To illustrate how much thought is being given to batching plants, herewith is a line drawing showing in plan and elevation a layout that has been made for a producer-retailer in a large western city. What follows is an explanation of how the plant will operate and what amount of service will go with the batched materials, also the estimated cost of such a plant and equipment. The line drawing does not show how the materials come to the batchers, but takes the material through the batchers to the contractor's job.

The three compartments represent the sand, gravel and stone batchers and the cement chute. A monorail track is run under these batchers on which runs a series of tip-over buckets, each holding a batch. A separate waterproof compartment is provided in these tip-over buckets for the cement. This separate compartment is provided so as to deliver the cement to mixer in perfect condition in all kinds of weather and regardless of the length of time the batch has been made up. The batcher plant operator is to be kept busy making batches as directed, whether there are trucks to take the batches in yard or not.

The trucks are provided with a removable stake body, which has tracks thereon to interlock with the batcher plant monorail. When the truck driver comes to the yard he kicks the empties off on the empty track and takes loads from the loaded batch track.

The contractor will be furnished sufficient monorail track to accommodate ten loaded batch buckets and ten empties, unless the job warrants more. This is set up so that batches can be emptied from it into the mixer. When a truck brings in loaded batches the driver runs them on to one end of the track and then takes empties from the other end and returns to the batching plant to exchange the empties for loads.

The contractor erects this track for much less than he can build a cement shed, and his batches can stand for an unlimited time before use, because the cement is in a separate weatherproof compartment.

The retailer thus saves much truck waiting time, does not have rush periods in his batcher plants, and loses no batches due to rain or spoiled cement after batch has been made ready for delivery.

The contractor saves the building of a cement shed, does not have material losses from ground storage batches spoiled, and requires four less men to make his concrete.

The cost of this type of a batcher plant is well within what is justified by the reduced cost of service:

Batchers and cement chutes	$ 980.00
80 tip-over buckets with monorail	6,400.00
Monorail track, 300 ft. at $3	900.00
	$8,289.00

This system has capacity sufficient for ten trucks, allowing four batches per truck, and four extra buckets for each truck.

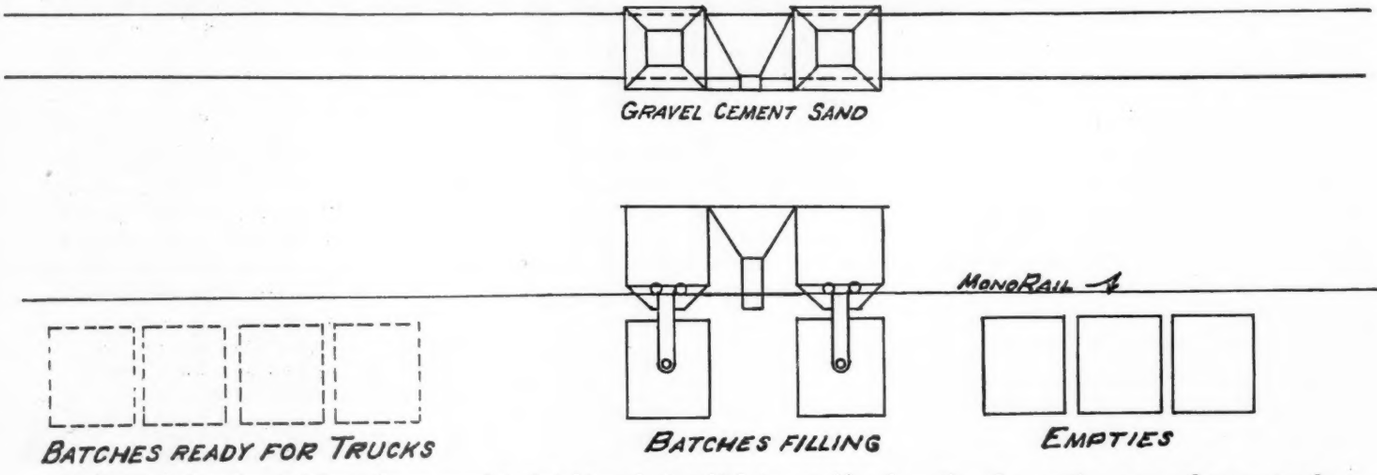
If this system were placed in operation when trucks were originally purchased, a large saving could be made, as no truck bodies or dump mechanism would have to be bought.

Contractor's Batching Cost

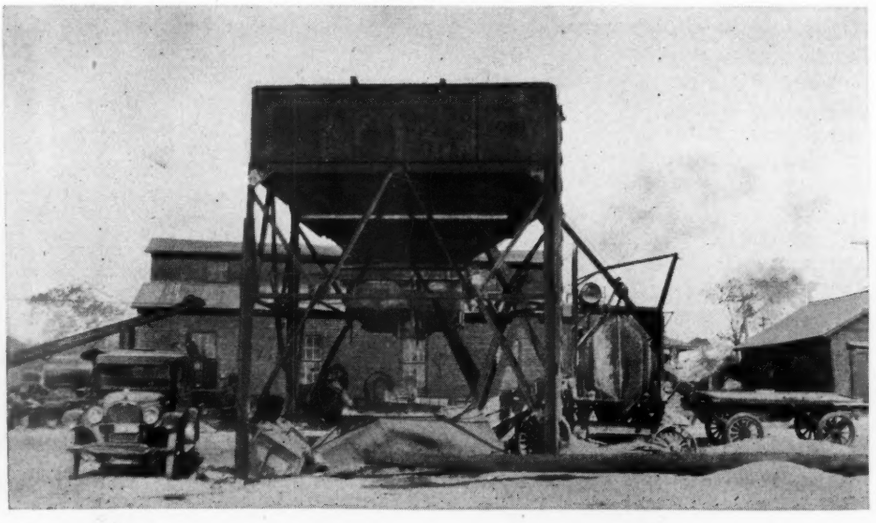
By way of showing the saving to the contractor, the following tabulation of a contractor's batching costs has been made. The figures were obtained from the construction costs of a building recently erected in Chicago. In all, 3280 yd. of concrete were batched, mixed and poured.

Total cost of materials used in the construction of batching plant	$1,195.00
Erection costs	630.00
Total gross cost	$1,825.00
Total cost of batching plant charged to this job	$1,113.50

The operation required five men, whereas if batched material from the batching plant as outlined in the preceding paragraphs had



Plan and elevation of layout for a complete batching plant, which is capable of continued operation even when no trucks are available for some time



A contractor's batching equipment set up at a stone uarry, and so arranged that the batches are immediately mixed in the mixer to the right and the mixed batch is taken by truck to the job

been used only two men would have been required.

An average of 80 cu. yd. of concrete per day was poured from the plant; therefore, if we divide 3280 by 80, we obtain 41 days for three men = 123 days at $8 = $984.

Extra labor required	$ 984.00
Total batching plant cost charged to this job	1,113.50
Total batching cost	$2,097.50

$2,097.50 for 3280 cu. yd. = 64c per cu. yd.

Therefore if the contractor had paid 25c per cu. yd. for batched materials on the basis

A well-desgned batching layout in a Chicago material yard

outlined above, the contractor would have saved 39c per cu. yd. on this amount of concrete.

Other features of a survey than the costs must be carefully considered, but they are individual matters and so they cannot be discussed in a general article. The capacity of a batching plant, for example, can only be decided upon after a careful survey of the particular market it is intended to supply. The location is also an individual problem, although the rule may be laid down that the batching plant should be placed so that it can be served by the same machinery that does the bulk loading. However, the operation of the batching plant should not be allowed to conflict with the bulk loading.

Advertising

The matter of the advertising needed is more a matter of salesmanship than engineering and should be left to the judgment of those in charge of sales.

If the salesman of a batcher plant has at his disposal some such a cost outline as above on some particular job in his territory he can sell his batched material in competition with unbatched materials at lower prices.

Thus we arrive at the following conclusion:

1. Batched materials from material yards have a place on the market.
2. Contractors will profit in the purchase of batched materials.
3. Engineers should welcome these batching plants because of the greater uniformity of the concrete that will result.
4. The progressive producers are planning new and improved batching plants.

Effect of Amount, Size, and Grading of Coarse Aggregate on Compressive Strength of Concrete

IN *Technical News Bulletins* Nos. 115 and 127 (November, 1926, and November, 1927) of the United States Bureau of Standards, were reported some of the results of an investigation of the factors governing the strength of concrete. Recently a more comprehensive study of the effect of the amount, size, and grading of coarse aggregate on the compressive strength of concrete has been made. For the study there were available the data resulting from the tests described in *Technical News Bulletin* No. 127, and, in addition, the results of a series of tests conducted during 1924.

For the earlier series Potomac River sand combined with Potomac River gravel and a single brand of cement were used in all the tests. Certain sizes of the sand and gravel were screened out so that the sizes of the resulting sands were 0 to No. 8, 0 to No. 4, and 0 to ⅜ in., and the sizes of the coarse aggregates were No. 4 to ¾ in., No. 4 to 2 in., and ⅜ in. to 1½ in. Using these aggregates and the cement selected, 72 mixes were made in the proportions given in the table of mixes attached to the 1924 "Report of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete."[1] The amount of water used in each case was that which gave the slump called for in this table of mixes. The amount of sand used varied from a minimum of 15 to a maximum of over 60% of the total aggregate.

As the mixes of the earlier series were designed to give 28-day compressive strengths, f'_c based on the equation $f'_c = \frac{14{,}000}{7w/c}$, in which w/c is the ratio of volume of the water to that of the cement, this equation was used as a basis for comparing the strengths of the resulting concretes. For the mixes in which the volume of the sand was less than one-half that of the coarse aggregate only four mixes gave strengths as great as that given by the equation. For the mixes in which the volume of the sand was at least one-half that of the coarse aggregate only seven gave strengths less than that given by the equation, and in all these seven mixes the coarse aggregate used (⅜ to 1½ in.) was entirely lacking in the finer material, No. 4 to ⅜ in.

[1]Appendix 16, *Proc. Amer. Soc. for Testing Materials*, vol. 24, p. 376; 1924.

In the latter series of tests Potomac river sand passing a No. 4 sieve was used throughout. Potomac river gravel, crushed limestone and crushed blast-furnace slag were used as coarse aggregate, and four different cements selected and prepared so as to give a wide range in strength were used. This series included tests with 160 different combinations of cements and aggregates. The results indicated that for each cement there was a characteristic water-cement ratio strength relation quite similar in form to that expressed by the equation $f'_c = \frac{14{,}000}{7w/c}$. For convenience, this relation for each cement has been referred to as its "normal" water-cement ratio strength relation. The tests showed (1) that for the various combinations of fine and coarse aggregates the amount of sand required to give a strength at least as great as that indicated by the normal water-cement ratio strength relation varied from about 33 to about 50% of the total aggregate, (2) that the percentage of sand as determined gave a satisfactory workable mix, (3) that it was about the smallest percentage of sand which would give a workable mix and (4) that these same percentages of sand gave higher strengths per barrel of cement per cubic yard of concrete than did any other combinations of the same aggregates; that is, they gave approximately the maximum economy of cement.

In a general way the second series of tests confirmed the conclusions from the first series, and the entire investigation furnishes useful suggestions regarding the formulation of a specification for the graduation of aggregates for concrete. A specification utilizing these suggestions might well require (1) that the aggregate should consist of at least 33% sand, (2) that for aggregates having only 33% sand the volume of the coarse aggregate of any one size should neither be greater than three times nor less than one-third that of the next smaller size except that no lower limit is placed on the amount of material of the largest size, and (3) that in case certain sizes of the coarse aggregate are massing the amount of sand should be in excess of 33% but not greater than 50% of the total aggregate. (The amount of aggregate passing any given sieve and retained on the next smaller sieve is here used to designate the aggregate of any one size.) Within the range of the tests under discussion such a specification would not bar out many suitable mixes of concrete nor would it admit many unsuitable mixes. It is believed that it would be applicable for a considerable range in sizes and gradings, but in view of the fact that the first series of tests showed that the necessary amount of sand depended somewhat upon the size and grading of both the fine and the coarse aggregates, it is not to be expected that a specification of this sort would apply to all cases.—*Technical News Bulletin* of the U. S. Bureau of Standards.

Action of Distilled and River Water, Tensile Strength of Cement Test Briquettes

Results of Some Original Investigations at the Laboratory of La Tolteca Compania de Cemento Portland

By Alton J. Blank

Chief Chemist, La Tolteca, Cia. de Cemento Portland, S. A., Tolteca, Hidalgo ,Mexico

ON PAGE 37 of the March 31 issue of ROCK PRODUCTS there appeared an article entitled, "Action of Pure Water on Cement Mortar Briquets," which revealed that: "Long-time tests made by French engineers resulted in their finding that distilled water had a decidedly disintegrating effect on portland and other cement briquettes, whereas river water with a high calcareous content had no effect whatever."

In view of the many experiments that have been conducted by the writer on this subject, and due to the fact that the results obtained have been the opposite of those received by the French engineers, the above article has been read with interest.

For a period of years it had been our custom to test briquettes only up to the age of 28 days. Something over a year ago it was decided to extend these tests and to that end the daily grind of cement was tested further at ages of 3 months, 6 months and one year.

The initial testing of the 1:3 sand briquettes at 3 months age gave rise to some alarm in view of the fact that there was had a slight retrogression in strength between the 29-day and 3-month period.

In having noted the extremely large amount of laitance that accumulated in the briquette storage tanks, it was decided to start our investigations with the object of learning whether the water used in the making up of the briquettes (which was the same as that used in the briquette tanks) gave any decidedly different results in way of disintegrating effect on the briquettes when similar test specimens were made up with and stored in distilled water.

Analysis of River Water

	Mineral Analysis River Water	
	Parts per million	Grains per U.S. gallon
Silica	92.3	5.383
Iron and alumina	10.0	.583
Calcium carbonate	134.0	7.816
Calcium sulphate	60.5	3.529
Magnesium carbonate	84.6	4.935
Sodium and potassium chloride	34.8	2.030
Sodium and potassium sulphate	14.0	.816
Loss, etc.	2.2	.128
Total mineral solids	432.4	25.220
Organic matter	Trace	Trace

A mineral analysis of the river water which was being used for mixing and storage purposes was found to be as above.

In perusing the available literature dealing with the various kinds of water suitable for use in the mixing and storage of cement mortar specimens, it is generally stated that "Water suitable for drinking purposes is recommended for concrete-making purposes." The average analyses of various waters suitable for concrete-making purposes was found to be considerably lower in "total mineral solids" when compared with the above analysis of our river water.

For comparative purposes a number of 1:3 sand briquettes were made up using river water and distilled water for mixing and aging purposes.

Example No. 1

All briquettes were made up from the same cement, the consistency of the mixtures being the same in all tests.

All briquettes were stored for the preliminary 24-hour period in the damp closet where the temperature was maintained at 21 deg. C., and for the remaining time in water kept at the same temperature.

Test Specimens No. 1—Briquettes made up with distilled water and aged in distilled water.

Test Specimens No. 2—Briquettes made up with distilled water and aged in river water.

Test Specimens No. 3—Briquettes made up with river water and aged in river water.

Test Specimens No. 4—Briquettes made up with river water and aged in distilled water.

	Tensile strength, lbs. per sq. in.			
Age at test	Test No. 1	Test No. 2	Test No. 3	Test No. 4
3 days	181	176	205	222
7 days	308	301	277	312
28 days	437	387	366	444
3 months	466	376	343	479

In Tests Nos. 2 and 3 there developed within a few days approximately ⅛-in. of laitance in the two briquette tanks. In Tests Nos. 1 and 4 there was no development of laitance at any time.

It is noticed from the above that regardless of whether river or distilled water was used in the making up of the briquettes, those briquettes aged in distilled water showed no signs of retrogression in strength at later ages, while the opposite results were had on those briquettes aged in river water.

Example No. 2

A second sample of cement was used for making another series of test specimens, these briquettes being made and allowed to age in the usual way.

Test Specimens No. 1—Briquettes made with river water and aged in river water.

Test Specimens No. 2—Briquettes made with river water and aged in distilled water.

	Tensile strength, lbs. per sq. in.	
Age at test	Test No. 1	Test No. 2
3 days	242	256
7 days	327	360
28 days	407	463
3 months	411	482

In Test No. 1 the laitance deposit in the bottom of the briquette tank was identical to that had in Tests Nos. 2 and 3 in Example No. 1.

In Test No. 2 there were no signs of laitance at any age.

Example No. 3

A third sample of cement was used for making another series of test specimens, these briquettes being made up and aged in the usual way.

Test Specimens No. 1—Briquettes made with river water and aged in river water.

Test Specimens No. 2—Briquettes made up with river water and aged in distilled water.

	Tensile strength, lbs. per sq. in.	
Age at test	Test No. 1	Test No. 2
3 days	248	263
7 days	290	310
28 days	370	412
3 months	367	445

Laitance development in Test No. 1, no signs in Test No. 2.

Example No. 4

A fourth sample of cement was used for making another series of test specimens, these briquettes being made up and aged in the usual way.

Test Specimens No. 1—Briquettes made with river water and aged in river water.

Test Specimens No. 2—Briquettes made up with river water and aged in distilled water.

Age at test	Tensile strength, lbs. per sq. in. Test No. 1	Test No. 2
3 days	279	284
7 days	311	356
28 days	376	459
3 months	372	506

Laitance development in Test No. 1, no signs in Test No. 2.

Example No. 5

For this test a fifth sample of cement was used in the making up of the test specimens, and briquettes were made up and stored as usual.

The water used in the making up of all briquettes consisted of a sample of Mexico City drinking water.

Test Specimens No. 1—Briquettes made up with Mexico City drinking water and aged in distilled water.

Test Specimens No. 2—Briquettes made up with Mexico City drinking water and aged in river water.

Age at test	Tensile strength, lbs. per sq. in. Test No. 1	Test No. 2
3 days	244	218
7 days	328	289
28 days	433	385
3 months	488	386

In all of the tests carried out there was had in no test a falling off or retrogression in tensile strength of briquette stored in distilled water, regardless of the kind of mixing water used. While, in practically every test where briquettes were stored in river water, a falling off in strength was experienced in most instances after the 28-day period of age, and in the remaining tests the increase in strength was practically negligible.

In all tests where briquettes were aged in river water deposits of laitance were found in the bottom of the briquette tanks within a few days after the briquettes had been stored there. While with the briquettes that were stored in distilled water no developments of laitance were noted.

An analysis of the laitance deposits found in the briquette tanks containing river water was found to be as follows:

	Chemical analysis of laitance
Silica	8.40%
Iron and alumina	3.60
Calcium oxide	44.61
Magnesium oxide	3.00
Ignition loss	35.60

The above analysis when calculated to a water and carbonic acid free basis gives the following:

	Calculation
Silica	14.09%
Iron and alumina	6.03
Calcium oxide	74.83
Magnesium oxide	5.03

It is interesting to note that, with the exception of the extremely high calcium and magnesium oxide contents, the silica and iron and alumina as found by the calculation is more or less in agreement with the amount of these constituents found in our normal raw mixtures.

C. L. Ford of the Portland Cement Association refers to the above developments of laitance as being due to the high calcium carbonate content of the river water used for storage purposes, and gives us the following further enlightenment on the subject:

"In the hydration of cement, calcium hydroxide is formed and dissolves to a slight extent in the storage water. This causes early supersaturation and precipitation of calcium carbonate, which is the main constituent of the laitance as shown by the above chemical analysis."

In concluding it may be stated that these results obtained are in entire disagreement with those found by the French engineers.

It is, however, possible that the river water used by them in their tests, though being of a highly calcareous nature, did not contain the large percentage of total mineral solids as is found in our particular river water.

Analysis of Oklahoma Coals Technical Paper

A SHORT description of the Oklahoma coal fields, including the physiography, geology and location of the deposits, is given in the 62-page Technical Paper 411 on the "Analysis of Oklahoma Coals," issued by the Bureau of Mines at Washington. The greater part of the paper is composed of tables of chemical analysis of samples obtained throughout the state together with a description of the samples and of the mining systems employed in the mines from which the samples were taken. The price of the bulletin is 10 cents and may be obtained from the Superintendent of Documents, Washington, D. C.

1928 Year Book of American Engineering Standards Committee

THE YEAR BOOK OF THE AMERICAN ENGINEERING STANDARDS COMMITTEE, issued June 4, 1928, describes the activities of the committee on standardization in many American industries during the past 12 months. Forty-nine new standards and 40 new projects are listed for numerous branches of engineering and industry, including mining, mechanical, civil, electrical, wood, textiles and safety.

The Year Book cites the discovery or the development of the best processes and practices possible with modern engineering knowledge, and the extension of these, as standards, to all branches of the industry. Up to the present time the A. E. S. C. has adopted 111 national standards and is working on 164 other standardization projects. The committee is in continual contact with the 19 national standardizing bodies in foreign countries and receives daily many requests from abroad for American standards or for information about standards in use in the United States.

Among the standardization projects which on April 15, 1928, had an official status before the committee and which are sponsored by the American Society for Testing Materials are the following: "Specifications for Fire Tests of Materials and Construction," "Test for Toughness of Rock," "Method of Test for Voids on Fine Aggregate for Concrete," "Sampling Stone, Slag, Gravel, Sand and Stone Block," "Test for Apparent Specific Gravity of Coarse Aggregates," "Cement Grout Filler for Brick and Stone Pavements," and "Specifications and Tests for Portland Cement" (under revision).

Influence of Durability Test on the Strengh of Concrete Aggregate

IN THE COURSE of the investigation of the durability of concrete aggregates, the preliminary results of which have been described in *Technical News Bulletin* No. 123 (July, 1927) of the United States Bureau of Standards, it was noted that the limestone specimens were subject to more or less disintegration in the boiling and drying test cylinders. To study this phenomenon further, a group of eight random samples of limestone block were selected, 2-in. diameter cylindrical test pieces approximately 2 in. high, or 2-in. cubes, being cut from each.

Before starting these tests each specimen was carefully examined for any cracks or other defects. The tests were carried out for 100 cycles, each cycle consisting of boiling in water for six hours and drying at 110 deg. C. for 17 hours. As the test progressed careful visual examinations were made from time to time without any signs of disintegration being noticed.

Comparative compressive strengths were determined upon untreated samples cut from the same blocks of stone. The results of these tests are given in the following table. In every case but one the boiling and drying cycles caused a reduction of strength.

There is an average reduction of 38% in strength as a result of the 100 cycles of boiling and drying treatment. In Sample No. 6 the average strength of the treated specimens is lower than the strength of the untreated specimens, the one case where the strength of the treated sample was higher than the untreated being evidently due to the selection of a portion of the stone having a relatively high strength.

Stone No.	Strength—Untreated samples Lb./in.²	Strength—of boiling and drying Lb./in.²
1	8500	5450
2	9700	3160
3	5600	4970
4	6750	4240
5	7850	3070
6	3500	4240
6	3500	1890
7	7550	5870

—*Technical News Bulletin* of the U. S. Bureau of Standards.

Iron Oxide vs. Alumina as a Fluxing Agent in the Manufacture of Portland Cement

A Further Discussion of the Beneficial Results Obtained Through the Addition of Iron Ore to Normal Raw Mixtures Employed in Portland Cement Manufacture

By Alton J. Blank
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IN VIEW OF the great number of letters of inquiry received from executives in the cement industry since the appearance in the May 26 issue of Rock Products of the article "Iron Oxide vs. Alumina as a Fluxing Agent in the Manufacture of Portland Cement," and in the light of further experience with this subject, a further discussion is thought advisable.

Due to the excellent fuel economy received through the addition of iron ore to normal raw mixtures, it was thought of interest to learn just what differences were to be found in the temperature required for clinkering of the normal raw mixtures, and normal raw mixtures to which iron ore has been added in small percentages.

Samples were therefore made up of the normal raw mix, and the normal raw mix to which iron ore had been added, and these mixtures were so proportioned as to have similar lime contents and were ground to the normal fineness of 85% passing the No. 200-mesh screen. They were then forwarded to a commercial testing laboratory for fusion point determinations.

Results obtained show that the normal raw mix begins clinkering between the temperatures of 2400 and 2450 deg. F., while the high iron raw mix begins clinkering between the temperatures of 2300 and 2350 deg. F. The average results of these fusion point determinations point to the fact that a temperature of 100 deg. F. less is required to clinker the high iron mix.

Why Iron Ore Additions Are Advisable

Data accumulated by the writer during the eight months' experimentation with the displacement of a part of the alumina content of raw mixtures with iron oxide has resulted in the following data and opinions being formed, being:

1. With the use of high iron raw mixtures it is possible to increase normal kiln outputs by 12% and up, depending on the amount of alumina in the normal raw mixtures that is displaced with iron oxide.

2. With the use of high iron raw mixtures it is possible to receive a saving in kiln fuel amounting to 12% and up, this also depending upon the amount of alumina in the normal raw mix that is displaced with iron oxide.

3. With the use of high iron raw mixtures it is possible to increase the quality of the cement from that of an ordinary portland cement to a "super" cement (or early high strength cement), and this can be accomplished without a further grinding of the raw mixtures, without harder burning of the clinker, and without further grinding of the cement over that which has been heretofore customary when burning normal raw mixtures.

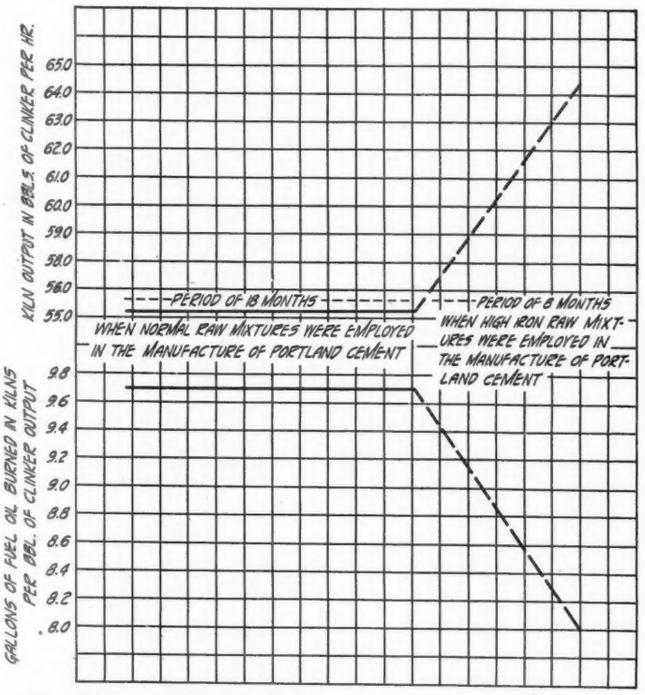


Chart No. 1. Showing the increased kiln outputs and decreased fuel oil consumption since the additions of iron ore were made to normal raw mixtures to displace a part of the alumina content with iron oxide

During the eight months of experimentation with high iron raw mixtures we have yet to receive our first unsound cement pat.

Where heretofore our cement was only an average portland cement insofar as strength qualities were concerned, and where there was little tendency towards an increase in tensile strength after the ages of 28 days, and where after 28 days retrogression in strength was a common occurrence, we are today receiving tensile strengths at ages of six months which average 100 lb. per sq. in. greater than those strengths received at 28-day age. Incidentally, the setting times of the cement are more uniform.

4. With the use of high iron raw mixtures we have not received the hard, abrasive clinker that had been expected. In fact, the high iron clinker, other things being equal, has been somewhat easier to grind than the normal clinker heretofore manufactured.

Other things being equal, with the majority of portland cement clinker the grindability is determined by the lime ratio. In our particular case we find that high iron clinker grinds easier than normal clinker having the same lime ratio.

5. With the use of high iron raw mixtures in kilns that are operated in connection with waste-heat boilers, a number of questions may arise.

Taking a period of months prior to the burning of high iron mixtures in the kilns we find that we were burning an average of 9.7 gal. of fuel oil in the kilns for each barrel of clinker produced, and in connection with this were generating 12.1 k.w.h. per barrel of clinker burned, or at the rate of 1.25 k.w.h. for each gallon of fuel oil burned in the kilns.

Taking a period of late months during which time high iron raw mixtures were burned in the kilns, we find that we are burning an average of 8.3 gal. of fuel oil in

the kilns for each barrel of clinker produced, and are generating 10.4 k.w.h. per barrel of clinker burned, or at the rate of 1.27 k.w.h. for each gallon of fuel oil burned in the kilns.

While practically the same amount of power is being generated in our waste-heat plant for each gallon of fuel oil burned in the kilns, the decrease in fuel oil necessary to burn a barrel of clinker has resulted in a decrease in power generation per barrel of clinker burned.

Therefore it is believed that cement plants which operate their kilns on natural draft would be in a better position for receiving the maximum of fuel economy by employing high iron raw mixtures, for where kilns are operated in connection with waste-heat boilers it is possible to carry fuel economy too far, so as to result in too little power being generated.

Chart No. 1

Referring to Chart No. 1 we find that during the 18-month period when normal raw mixtures were burned in the kilns, the output from the kilns averaged 55.4 bbl. per hour at a fuel consumption of 9.7 gal. of fuel oil per barrel of clinker burned.

Since high iron raw mixtures have been burned in the kilns the kiln output has reached 64.4 bbl. per hour at a fuel consumption of 8 gal. of fuel oil per barrel of clinker, which has resulted in an increased kiln output of 12% and a reduced fuel consumption of 12%.

Due to the waste-heat boiler connection with the kilns, we have not tried for greater fuel economy, though for periods of a week or more the fuel consumption per barrel of clinker burned has been as low as 7.2 gal., while the kiln output has been as high as 68 bbl. of clinker per hour.

Chart No. 2

Turning to Chart No. 2, we have the alumina-iron oxide ratio in the clinker (alumina % divided by iron oxide %) plotted against the number of gallons of fuel oil required to burn a barrel of clinker, these figures representing average monthly results.

With the exception of two or three points on the chart (where abnormal conditions existed in the kiln room) it will be found that the ratio of iron oxide to alumina has a direct bearing on the gallons of fuel oil required to burn a barrel of clinker.

Chart No. 3

Reverting to Chart No. 3, we have the lime ratio of the clinker ground plotted against the output of cement received hourly from 6 ft. by 22 ft. tube-mills, when ground to a fineness of 84.8% passing the No. 200-mesh screen.

With the exception of several months when hot clinker and other abnormal conditions existed in the grinding department, it will be found that the lime ratio of the clinker ground has a direct bearing on the tube-mill outputs in barrels of finished cement per hour.

Summary

Summed up, we find the efficiencies and economies in favor of high iron raw mixtures over normal raw mixtures as being:

1. Fuel economy.
2. Increased kiln outputs.
3. Somewhat better grindability of clinker.
4. Increased cement quality, in that it is possible to manufacture a "super" cement with high-iron raw mixtures at a lower production cost than it was heretofore possible to manufacture an ordinary portland cement from ordinary raw mixtures.

Proceedings of the 14th Annual Indiana Road School

IN Bulletin No. 19 of the engineering extension department of Purdue University, Lafayette, Ind., are compiled the proceedings of the 14th annual road school held at Purdue University, January 16-20, 1928. The school is under the direction of the civil engineering and engineering extension departments of the university, with the cooperation of state, county and municipal highway commissioners.

Several papers, concerning municipal paving problems, state construction and inspection, maintenance of secondary types of roads, safety, transportation problems and other subjects related to the department's activities, are included in the bulletin. A paper by the state auditor for Indiana describes Indiana's transportation system finances and gives general statistics. The bulletin, which contains 125 pages, is illustrated and has several tables of road construction data and repair cost data.

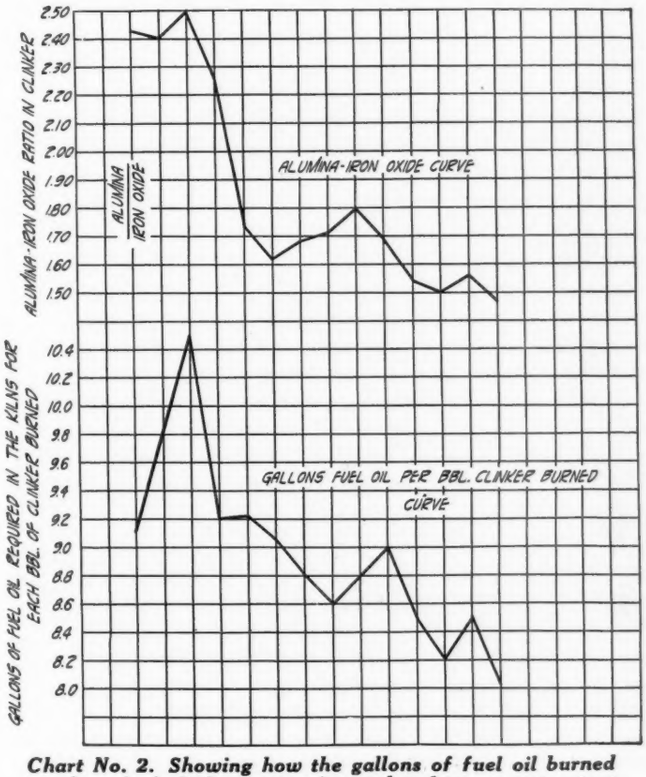

ALUMINA-IRON OXIDE RATIO IN CLINKER
ALUMINA / IRON OXIDE
ALUMINA-IRON OXIDE CURVE
GALLONS OF FUEL OIL REQUIRED IN THE KILNS FOR EACH BBL. OF CLINKER BURNED
GALLONS FUEL OIL PER BBL. CLINKER BURNED CURVE

Chart No. 2. Showing how the gallons of fuel oil burned per barrel of clinker output is regulated to a great extent by the ratio of iron oxide to alumina

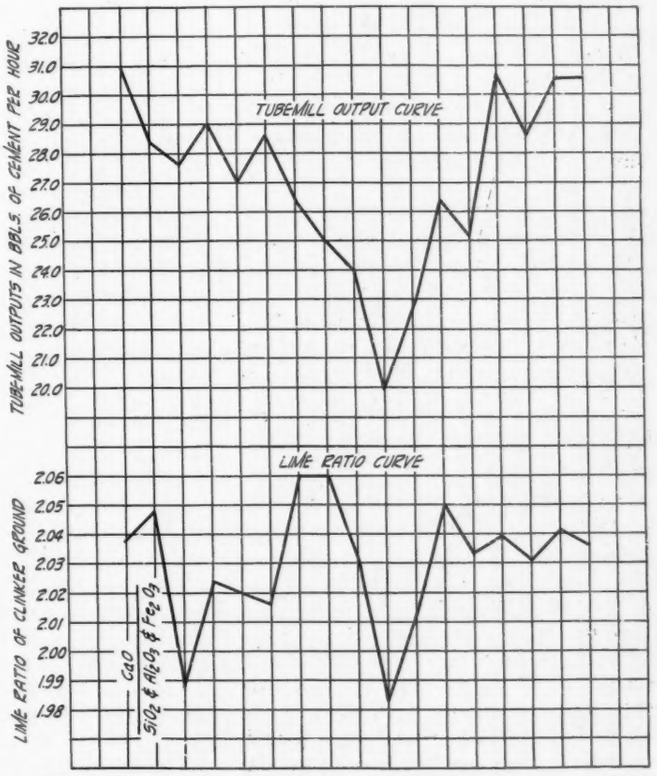

TUBE-MILL OUTPUTS IN BBLS. OF CEMENT PER HOUR
TUBEMILL OUTPUT CURVE
LIME RATIO OF CLINKER GROUND
LIME RATIO CURVE
CaO / SiO2 & Al2O3 & Fe2O3

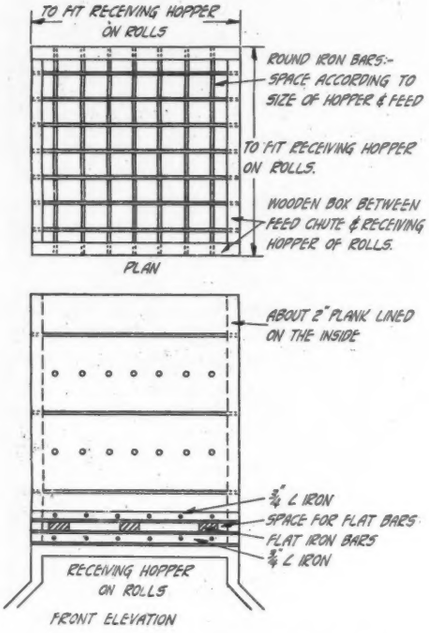
Chart No. 3. Showing the bearing had by the lime ratio in the clinker on the grindability of same

Hints and Helps for Superintendents

A Feed Box for Rolls

By W. L. Home
Mining Engineer, Pine Plains, N. Y.

WHERE crushing rolls are operated without mechanical feeders or other methods of distributing the feed evenly throughout the width of the rolls it is likely that the roll shells will become unevenly worn and corrugated. Much of this can be avoided


TO FIT RECEIVING HOPPER ON ROLLS
ROUND IRON BARS:- SPACE ACCORDING TO SIZE OF HOPPER & FEED
TO FIT RECEIVING HOPPER ON ROLLS.
WOODEN BOX BETWEEN FEED CHUTE & RECEIVING HOPPER OF ROLLS.
PLAN
ABOUT 2" PLANK LINED ON THE INSIDE
¾" L IRON
SPACE FOR FLAT BARS
FLAT IRON BARS
¾" L IRON
RECEIVING HOPPER ON ROLLS
FRONT ELEVATION

Feed box to distribute the flow of material to rolls

by the use of the home-made feed box illustrated. This is simply a square box, having neither top nor bottom, which is made to fit or rest on top of the receiving hopper above the rolls. The inner walls of the box are lined with iron, and holes are bored in the sides for the round iron bars, as shown in the drawing. The bars are placed with first row runing parallel to the opening between the rolls, and below this another at right angles to the first row, with the bars spaced the same distance apart as the top row. Below these are other rows, equally spaced, and each row is at right angles to that above, with the bottom row parallel to the top row. At the bottom of the feed box, on the front and back side, should be an open slot across the entire width. The feed condition may be observed here and may be further altered in its course by inserting flat iron bars across the bottom of the feed box where needed. By doing this not only can one keep the roll shells wearing more evenly but the feed can be diverted to wear down places already high.

When both rolls are in perfect alignment and yet wear high at the outside edges, the trouble may be with the adjustment both of the feed and the cheek plates. If there is sufficient clearance between the rolls themselves and the cheek plates to allow a part of the feed to drop through here and the feed is diverted against this outside edge, such trouble will probably end.

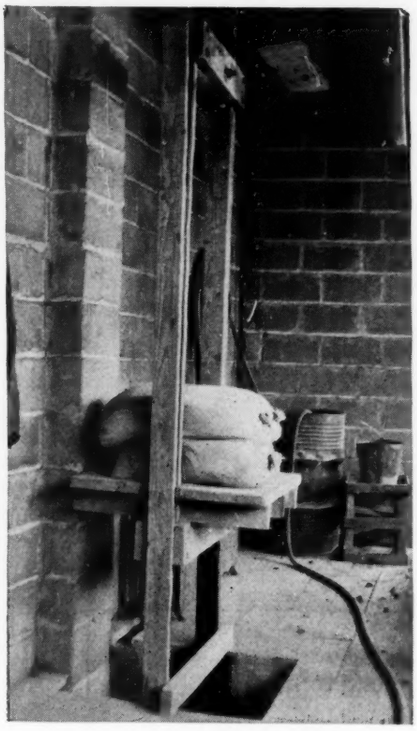
Cement Elevator for Products Plants

THE illustration shows a convenient elevator for sacks of cement, which is particularly useful in cement products plants. The elevator can easily be made at the plant, and will be found to be well worth the trouble of construction, as it permits the storing of bags on the ground floor, and the only handling required is placing the bags on the elevator. As the bags are left on the elevator until they are to be emptied into the mixer there is no wasted time stacking beside the mixer, and as the elevator can be adjusted to any height, the top bags can always be reached conveniently without it being necessary for the mixer man to stoop over for them.

The frame of the elevator is constructed as shown with uprights about 6 ft. long fastened together at the top by pieces of 2 x 4's. At the bottom is a platform approximately 30 in. square, on which can be piled as many as 15 bags at one time. The elevator runs on upright "tracks" or 2 x 4's which reach from the floor of the first story to the roof of the plant. It is held to these upright pieces by reason of the 2 x 4's at the top and bottom of the frame which extend beyond the rest of the frame as shown. At the products plant of Edgar D. Otto, at Downers Grove, Ill., where such an elevator is in operation, power is supplied to the elevator from the main line shaft which runs the machinery of the plant, and by a hoist drum built into the mixer.

The Value of Good Will

GOOD WILL IS AN ASSET which used to appear regularly on financial statements. It was quite frequently used to avoid showing a deficit on the balance sheet, and as there was no yardstick with which to measure its value in dollars and cents, the figures could be boosted as high as was considered advisable by those who prepared the statement.



Convenient elevator for handling bags of cement in a products plant

Good will, however, has a value. It is true that it is hard to place a cash value on it; nevertheless, it is a very real asset and many commercial organizations have found this out to their sorrow when once they had lost the good will of the purchasing public.

Good will is, therefore, something which cannot be ignored in this modern commercialized world. It has vast potential powers. It may make or break a company or an industry. Like many other intangible things, it may have more real value than those things which can be measured by dollars and cents, and we cannot afford to ignore this very real if intangible asset if we are to make a success of our business.

Good will may be divided into three classes: Good will on the part of those who purchase our materials; good will on the part of potential customers, and good will on the part of those who are working with us to make our company grow in importance and usefulness.

Good Will of Customers

The first of these, good will on the part of our customers, needs no illustration. Every one of our salesmen realizes the importance of keeping our companies "sold" to those who purchase from us. Every salesman knows

that if a customer becomes "sour" on the company, he is a customer lost unless prompt measures are taken to restore him to a better frame of mind. A disgruntled customer is in the proper frame of mind to listen to and agree with the arguments of our competitors; and, once lost, it is a difficult job to get him back. It is much easier to *retain* what you have than to *regain* it.

The salesman calls upon the trade and secures the orders, and while his attitude, whether good or bad, is reflected upon the company as a whole, still it is true that those things which cause dissatisfaction are usually not the salesman's fault, but can be traced back to other departments of the company. There are many causes for dissatisfaction. The operating department may be careless in manufacture or inspection. The packing or loading may be carelessly done. The wrong kind of goods may be shipped or an account may be wrong; goods may not be shipped on the date specified; errors in billing may occur; the credit or the accounting department may take an improper attitude, etc., etc. All of these things tend to decrease good will on the part of our customers and are reflected back on the company, and it is true that one order handled incorrectly makes a much greater impression than a dozen orders handled without error.

Good Will of Prospects

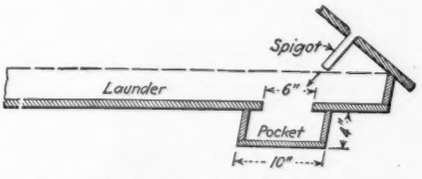
The second class of good will mentioned is that on the part of prospective customers. The necessity for building up good will wherever possible among those who may become customers for our products is self-evident. It is for this class more than any other that millions of dollars are spent annually for advertising. Whether or not you chew gum, you have heard of Wrigley's Spearmint, and the chances are that if you were in the market for chewing gum, Wrigley's would be the first name that would pop into your mind. To become favorably known is the first step in building wood will among prospective customers. Then if the goods are purchased and found satisfactory and as represented, you have changed a prospect into a customer—all as a result of building good will in the mind of the prospect. The things which cement such a customer to us is the unfailing courtesy and good will expressed by every branch of the company with whom he comes in contact directly or indirectly, and that means practically everyone in the organization who has anything to do with selling, manufacturing, packing, shipping, billing and collecting. All of these, if rightly handled, tend to build good will.

Good Will of Employes

The third class of good will is one which is more apt to be overlooked but which is by no means the least important, and that is the good will expressed by the attitude of each one of us towards our company. If we are not thoroughly convinced that we are a part of an organization that is worth while and one which treats everyone fairly and honorably, then we cannot do our best work and we cannot properly convey to others a good impression of our company. Unconsciously, each one of us has an influence on the other, and the company spirit is a composite of the spirit of all of those employed by the company. If a spirit of unrest or discontent is prevalent or a lack of co-operation exists, all of this is reflected in the attitude of the public towards our company. If all the employes speak well of the company for which they work and stoutly maintain that it is the best company in its line, gradually the public will come to accept this attitude as truth. In order to foster this good will on the part of our fellow employes, each one of us should do his best to avoid friction and to maintain a spirit of helpfulness toward all with whom he comes in contact. This is particularly true of those who have the direction of others. To the man under him, the foreman or department head is the company, and the treatment he receives from his superior will largely determine his attitude toward the company in general.—*Warner-American News.*

Preventing Wear in a Launder

A LAUNDER which conveys products from jig and classifier spigots usually wears through in a short time at a point where the sand from the spigot strikes its bottom. A scheme used in some mills for avoiding this wear consists in cutting a hole 4-in. square in the bottom of the launder at this point and constructing a pocket 4 in. deep and 10 in. square below the launder, as indicated in the illustration. The sand accumulates in the pocket and receives the impact of the material discharged from the spigot.—*Engineering and Mining Journal.*



A pocket under the spigot prevents wear in a launder

Churn Drilling Costs

THE basic unit of cost in open-cut rock excavation is either a ton or a cubic yard. In order that an accurate ultimate cost unit of finished material may be established, it is necessary that the cost of each excavation operation be reduced to a basic unit. In quarrying and metal mining the unit is usually a ton, while on stripping and construction work the yard is employed.

Primary drilling cost is determined by dividing the cost of drilling one foot by the number of yards or tons in the solid displaced by 1 ft. of excavation at the drill-hole spacing being used on the given job. A bird's-eye view of the whole structure of drilling costs may be secured from the acpanying circular diagram which refers to the four main factors that have to do with drilling and blasting characteristics.

The use to which the excavated material is to be put governs the drill spacing and strength and ratio of explosive. The physical nature of the rock governs the rate of speed at which it can be drilled and the amount of repairs and renewals necessary.

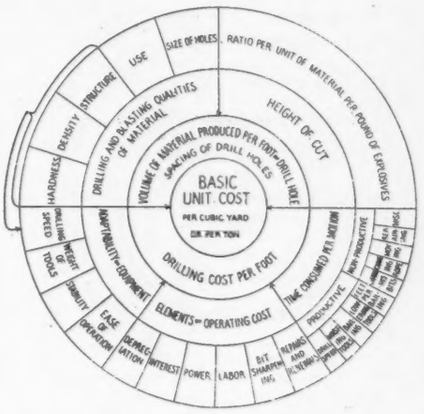


Diagram showing allocation of costs for churn drilling

An example of the relation of the factors that go to make costs and their variation on different jobs is given in the analysis at the bottom of the page, shale, limestone and trap rock for various purposes.

COST EXAMPLES OF CHURN (BLAST-HOLE) DRILLING

Material	Shale	Limestone	Limestone	Trap Rock
Produced for	Railway cut	Cement	Crushed Stone	Crushed Stone
Face height, ft.	30	45	70	160
Structure	Thin beds	Thin beds	Thick beds, 20° dip to face	Columnar
Diameter holes, in.	5	6	6	8
Hole spacing, ft.	15×18	14×19	16×18	22×26
Tons blasted a foot	22	22.4	24	54
Hourly footage	9	5	4	1
Operating cost an hour:				
Depreciation	$0.15	$0.14	$0.19	$0.21
Interest	.06	.06	.07	.08
Power	.15	.18	.20	.22
Labor	1.05	.90	1.10	1.25
Bit dressing	.06	.10	.20	.40
Repairs	.03	.02	.04	.04
Renewals	.20	.26	.30	.30
Total hourly cost	1.70	1.66	2.10	2.50
Drilling cost a ft.	.19	.33	.425	2.50
Drilling cost a ton	.0086	.0147	.0177	.046

—*M. B. Garber, Jr., in The Explosives Engineer* (May, 1928).

Rock-Dusting of Coal Mines as Safety Measure Makes Little Progress

ALTHOUGH it is now generally recognized that widespread explosions can be almost absolutely prevented in coal mines by efficient rock-dusting, and that this rock-dusting can be done thoroughly at low cost, a recent survey by the United States Bureau of Mines, Department of Commerce, shows that, while some progress is being made by the coal-mining industry, many mining communities are slow in taking advantage of one of the most effective safeguards available.

While a similar survey made by the Bureau of Mines in the fall of 1925 showed that about 92 coal companies in the United States were using rock-dust, the more recent survey, made in the summer of 1927, disclosed that the number had increased to 239, representing approximately 160% increase. Similarly, from the fall of 1925 to the summer of 1927, the number of mines using rock-dust increased from 177 to 463, or about 160% increase. This appears to be a decidedly healthy increase, but when it is considered that there are approximately 7,100 bituminous mines operating and that there were only 463 or 6½%, which were even reported to be using rock-dust to any extent whatever, the foregoing figures as to progress leave much room for improvement.

A more favorable aspect of the situation is that the annual output of the mines using rock-dust in the summer of 1927 was over 137,000,000 tons, as against about 54,000,000 tons in 1925, hence the mines now using rock-dust produce about 24% of the country's bituminous coal. The fact that mines using rock-dust represent but about 6½% of the total number of operating mines, yet produce about 24% of the tonnage, shows that it is the larger capacity mines which are progressive as to this precaution. Mines using rock-dust in the summer of 1927 employed about 109,000 underground workers out of a total for the United States of about 510,000, hence only about 21% of the underground workers in the bituminous and lignitic mines are being given at least partial protection by rock-dusting. The rock-dusting survey made in the fall of 1925 indicated that mines using rock-dust employed about 50,000, hence an additional 60,000 were brought under protection by rock dust since.

In 1925 it was found by careful inquiry that rock-dust was used in mines in 13 states, while in 1927 this method of mine protection had been extended to 17 states. The states in which most general attention has been given rock-dusting in proportion to the total number of mines operated are, in order: Utah, with 100% of the mines reported as using rock-dust; New Mexico, with 43%; Wyoming, with 31%; Alabama, with 23%; and Colorado, with 14%.

Pennsylvania, with 129 mines using rock-dust, heads the list of states in number of mines taking this precaution against widespread explosions; West Virginia is second with 89, Alabama third with 52, Utah fourth with 38, and Colorado fifth with 31; then follow Illinois with 25, Wyoming with 19, and Kansas and Kentucky with 18 each.

Situation Not Encouraging

Although the situation as regards rock-dusting in coal mines has improved much from that in 1923, when scarcely a dozen mines in the United States were using rock-dust, in 1925, when 177 mines used it and in 1927, when the total was 463, numerous phases of the situation are still by no means encouraging, says the bureau. Several states have enacted laws or regulations on rock-dusting, but in general they are not effectively enforced. Although the recent survey indicates that rock-dust is being used in 463 mines in the United States, it is decidedly improbable that 50 of these mines are adequately rock-dusted. Bureau of Mines field men have reported a number of mines as being at least fairly well protected from widespread explosions where combined rock-dusting and watering systems are in use, but there have been few if any mines reported as being adequately rock-dusted where dependence is placed on rock-dusting alone. Moreover, there are very few mines in which anything like adequate measures are employed, to ascertain definitely whether rock-dusting which has been done is or ever was of such nature as to prevent or to limit an explosion.

All coal mines, other than high-grade anthracite, should be rock-dusted unless they are decidely wet throughout, the Bureau says. In such mines all open accessible parts (including air courses, abandoned rooms, pillars, crosscuts, etc.) which are not decidedly wet should be kept rock-dusted to such an extent that any dust to be found on ribs, roof, floor, or timbers will have an incombustible content of 65% or over; however, as to working places which are advancing, rock-dusting should be maintained to the last open crosscut in accordance with the above requirement if at all feasible.

There should be systematic periodical sampling of dust from mine surfaces with prompt determination of incombustible content and with subsequent redusting where analytical work indicates incombustible below 65%. In general, surfaces should be sampled at least monthly, but sampling should be done more frequently where there is reason to suspect high combustible. Quick, simple methods of sampling and analyzing are available, and every mine which uses rock-dust should have this analytical work done as routine procedure.

Rock-dusting to be effective must be made an integral part of everyday mining operations; this means that mining companies must rock-dust in essentially the same manner that they timber, blast, ventilate and haul. Where rock-dusting becomes daily routine work its cost will be nominal and seldom should it exceed 1 cent per ton of coal produced. Until rock-dusting becomes a part of routine daily coal-mine operation, it will remain more or less ineffective, and the coal mines will continue to be subject to widespread explosions.

Dusting Must Be Thorough

One unfavorable feature is the tendency to assume that the presence of some rock-dust in some parts of a mine gives the entire mine immunity from disaster. This is a decidedly mistaken view, according to the Bureau of Mines. Rock-dusting to be effective must be done thoroughly, and all accessible surfaces of the mine, including haulage entries, air courses, working or abandoned rooms, pillars, etc., should be kept covered with rock-dust unless those surfaces are wet (not damp); and there should be systematic sampling and analyzing of dust from mine surfaces (ribs, roof, floor, timbers) with redusting wherever the incombustible falls below 65%. It should also be borne in mind at all times that rock-dusting, while an effective preventive of widespread explosions involving coal dust, is by no means a cure-all for explosions, hence, even if the mine is well rock-dusted, there should be no relaxation in other measures affecting coal-mine safety, including use of effective ventilation, use of permissible closed lights, of permissible explosives, of permissible electrical equipment, etc. In fact, rock-dusting is but one of the many precautions which should be always kept in effective operation if the mines are to be made safe; and rock-dusting must be done thoroughly if its effectiveness is to be assured.

Rock-Dusting Coal Mines

LIMESTONE AND GYPSUM rock dusts are the only healthful ones to employ in dusting bituminous coal mines to prevent explosions and fires. The constant loss of life from this cause has been proof enough to all who read the daily papers that rock-dusting has not been universally adopted. The statistics printed here are proof enough that in spite of the fact, proved beyond question of doubt, that the effective use of rock dust prevents disastrous explosions and loss of life, mine owners are slow in using it. Some progressive in every state, with some feeling of Christianity toward his fellow man, should see to it that a public movement is started to compel mine operators by state law to take this safety precaution, as is now done in Utah. Why not you?

—The Editor.

Editorial Comment

Crushed Stone and Aviation

At first blush one would hardly connect crushed stone and aviation; but, it seems that the approved method of marking airports is by paths or bands of light-colored or white-washed crushed stone. We haven't the specifications for the crushed stone, but presume that screenings are the best material. For example, we learn that the new airport at Colorado Springs, Colo., is marked by a white, crushed-stone circle 100 ft. in diameter, the crushed-stone band or path being 4 ft. wide. Also the name of the city is made on the field with letters 22½ ft. high, of crushed stone.

Selling an Industry on an Association

In this "land of the free and the home of the brave" no business man *has* to belong to the trade or industrial association designed to serve him directly, and indirectly through service to his industry as a whole. Of course, no one wants it different, although it is annoying always to those who do support an association to be aware that others in the industry, who do not, profit from its activities, at least to some extent. This is best for the country, the industry, the association, and the individual—that membership in such associations be voluntary, and that the staff of an association be always on its toes to *sell* the association to the industry and to continuously justify its existence by constructive work.

It once was thought sufficient to sell the association, or the association idea, to the executives of an organization —the ones who hold the purse strings. A business concern went in or out of an association on the decision of one or two men, or at most a board of directors acting on the advice of one or two men. Nowadays the most successful association executive realizes that his selling job does not end with the executive officers of his member companies but extends all the way down the line to the last one of their employes.

The original idea of a trade association was to promote sales; this is still a main objective, to be sure, but is far from being the only main objective of a *successful* association. The roots of an association like the Portland Cement Association, are deeply embedded in its member company organizations, because through research work plant chemists benefit; through its conservation work the operating foremen benefit; through its accident prevention work every last man in the plant benefits, and his wife and children, too. The whole portland cement industry feels the influence of the association—*is sold on it.* Is it any wonder, then, that with such an association no thinking, reasoning executive is going to decide on membership or non-membership in any offhand, selfish, arbitrary way. The modern business executive realizes his responsibility to his business associates and employes, as well as to his stockholders, for he knows his stockholders will suffer if he does not have and hold the confidence and goodwill of his own organization.

Unselfish Selfishness

Accident prevention effort has often been presented to business executives as worthy of their attention on wholly selfish grounds—that the money and lost time saved more than paid for the maintenance expense of safety organizations and mechanical safeguarding of machinery. This is because the humanitarian considerations are generally held to be self-evident, but at the same time not to have a very strong appeal to "hard-boiled" business men.

But one of the great things organized safety work has done for industry is to soften some of these same "hard-boiled" business men, unconsciously perhaps, in many cases. They have come to experience the joy that comes to intelligent men from a knowledge that they have contributed to the comfort and happiness of some of their fellow men. They have come to experience that a little unselfishness and a small measure of altruism has a place, even in the "hard-boiled" business world.

But, the interesting part of the story is that they actually do profit, without specific design, from their unselfishness by greatly strengthening the morale of their organizations and by raising the general average of intelligence, trustworthiness, and loyalty of their employes. Few executives ever stop to realize the part that freedom of movement, and the opportunities to get about and meet other business men, have played in their own development. They are more apt to ascribe their business superiority to superior intellectual endowment than to the broadening influence of business contacts and the self-confidence which comes from intimate acquaintances with other business men. So they do not realize the handicap under which mill men suffer, tied down to a small locality.

Yet from these men must come, in most cases, the presidents, general managers, superintendents and foremen of the rock products industries of the future. Certainly they are going to be better executives, and they are going to be "executive timber" the *sooner* for the opportunities given them through organized safety work and regional safety meetings. So a by-product of unselfishness in accident prevention is a higher grade organization all the way along the line; and every executive knows that to build up that kind of an organization is the greatest achievement of management.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. com.[37]	12-30-27	3	7	
Allentown P. C. 1st 6's[37]	12- 5-27	90	92	
Alpha P. C. new com.	7- 2-28	47	47¼	75c qu. July 14
Alpha P. C. pfd.[2]	7- 2-28	117	.....	1¾% qu. June 15
Amer. Aggregate 6's, bonds	7- 5-28	101¾	.....	
Am. L. & S. 1st 7's[32]	2-24-28	101¾	102½	
American Silica Corp. 6½'s	7- 3-28	98¼	99¼	
Arundel Corp. new com.	7- 3-28	44	44¼	50c qu. July 2
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	7- 2-28	105	109	
Atlas P. C. com.[2]	7- 2-28	41	43	50c qu. June 1
Atlas P. C. pfd.	7- 2-28	46	.....	66⅔% qu. July 2
Beaver P. C. 1st 7's[30]	6-29-28	98	100	
Bessemer L. & C. Class A[4]	6-29-28	34¼	36	75c qu. May 1
Bessemer L. & C. 1st 6½'s[4]	6-29-28	100¼	101½	
Boston S. & G. com.[16]	6-29-28	77	81	$1 qu. July 2
Boston S. & G. 7% pfd.[16]	6-29-28	83	85	1¾% qu. July 2
Boston S. & G. 1st pfd.[16]	6-29-28	94	96	2% qu. July 2
Canada Cem. com.[43]	6-30-28	27½	29½	
Canada Cement pfd.[43]	6-29-28	99	100	1.62½c qu. June 30
Canada Cement 5½'s[11]	6-29-28	101	102	
Canada Cr. St. Corp. 1st 6's[11]	6-29-28	96	99	
Certainteed Prod.	7- 2-28	41½	42⅜	$1 qu. July 1
Cleveland Stone new st'k	7- 2-28	.....	77¾	50c Sept. 1
Consol. Cement 1st 6½'s, A[42]	7- 3-28	95	99	
Consol. Cement 6½ notes[24]	7- 3-28	93	96	
Consol. Cement pfd.[41]	7- 2-28	40	60	
Consumers Rock & Gravel 1st 7's[20]	6-29-28	102½	103	
Coosa P. C. 1st 6's[32]	12-28-27	65	75	
Coplay Cem. Mfg. 1st 6's[40]	7- 2-28	90	.....	
Coplay Cem. Com.[40]	7- 2-28	12½	.....	
Coplay Cem. pfd.[40]	7- 2-28	72½	.....	
Dewey P. C. 1st 6's[30]	7- 2-28	99	101	
Dolese & Shepard[7]	7- 2-28	154	157	$2 qu. July 2
Edison P. C. com.[39]	7- 2-28	50c	.....	
Edison P. C. pfd.[39]	7- 2-28	1	.....	
Edison P. C. bonds[39]	7- 2-28	75	.....	
Fredonia P. C. 1st 6½'s[32]	12-28-27	97	101	
Giant P. C. com.[25]	7- 2-28	28	32	
Giant P. C. pfd.[25]	7- 2-28	30	35	3½% June 15
Ideal Cement com.	7- 2-28	142	144	$1 qu. July 1
Ideal Cement pfd.*	7- 2-28	110	111	$1.75 qu. July 1
Ideal Cement 5's	6-30-28	100	102	
Indiana Limestone 6's	7- 2-28	95⅞	.....	
International Cem. com.	7- 3-28	66¾	67	$1 qu. June 29
International Cem. bonds 5's	7- 2-28	97¼	97½	Semi-ann. int. payable June 15
Kelley Is. L. & T. new st'k	7- 2-28	52⅜	54	62½c. qu. July 2
Lawrence P. C.[2]	7- 2-28	106	110	2% qu.
Lehigh P. C.[2]	7- 2-28	50	52	62½c Aug. 1
Lehigh P. C. pfd.[2]	7- 2-28	109	111	1¾% qu. July 2
Lyman-Richey 1st 6's, 1931[13]	6-29-28	99	100	
Lyman-Richey 1st 6's, 1935[13]	6-29-28	98	100	
Marblehead Lime 1st 7's[14]	6-29-28	100	.....	
Marbleh'd Lime 5½'s, notes[14]	6-29-28	98	.....	
Mich. L. & C. com.[19]	7- 2-29	35	.....	
Missouri P. C.	7- 5-28	42	43	50c qu. May 1
Monolith P. C. com.[9]	6-29-28	15½	16	8% ann. Jan. 2
Monolith P. C. pfd.[9]	6-29-28	9½	10	
Monolith P. C. units[9]	6-29-28	34½	36	
National Cement 1st 7's[38]	6-29-28	99	101	
National Gypsum A com.[35]	7- 2-28	27	29	
National Gypsum pfd.[35]	7- 2-28	65	68	1¾% qu. Apr. 1
Nazareth Cem.[26]	6-29-28	31	33	75c qu. Apr. 1
Newaygo P. C.[1]	12-30-27	115	.....	
Newaygo P. C. 1st 6½'s[32]	2-11-28	120	.....	
New Eng. Lime pfd., A[45]	6-14-28	95	.....	
New Eng. Lime pfd., B[22]	6-29-28	97	99	
New Eng. Lime com.[22]	6-29-28	34	36	
New Eng. Lime 1st 6's[14]	6-29-28	98	100	
N. Y. Trap Rock 1st 6's	7- 3-28	101⅛	102½	
North Amer. Cem. 1st 6½'s	7- 2-28	81	83	
North Amer. Cem. units[19]	7- 2-28	.....	50	2 mo. per at 7%
North Amer. Cem. com.[19]	7- 2-28	.....	9	
North Amer. Cem. pfd.[19]	7- 2-28	.....	40	$1.75 qu. Aug. 1
North Shore Mat. 1st 5's[15]	7- 2-28	99	.....	
Northwestern States P. C.[37]	11-21-27	165	170	
Pac. Coast Cem. 6's, A	6- 1-28	.....	98	
Pacific P. C. new com.[5]	6-29-28	15	22	
Pacific P. C. pfd.	6-29-28	.....	78	1.62½ qu. Apr. 5
Pacific P. C. notes[5]	3-22-28	99	.....	3% s.-a. Oct. 15
Pacific P. C. 6's	6-29-28	.....	100	
Peerless Egyp'n P. C. com.[21]	7- 2-28	2	2⅜	
Peerless Egyp'n P. C. pfd.[21]	7- 2-28	80	90	1¾% qu. July 1
Peerless Egyp'n P. C. war.[21]	7- 2-28	3	6	
Penn-Dixie Cem. 1st 6's[29]	7- 2-28	99¼	99⅝	
Penn-Dixie Cem. pfd.[28]	7- 5-28	94½	95	1.75 qu. July 1
Penn-Dixie Cem. com.	7- 5-28	22¾	23½	50c qu. July 1
Petoskey P. C.	7- 3-28	11½	12¼	1½% qu.
Pittsfield L. & S.[31]	10- 8-27	.....	100	
Pittsfield L. & S. com.[31]	10- 8-27	.....	25	
Riverside P. C.	6-29-28	180	.....	50c mo. June 1
Rockland-Rockport Lime 1st pfd.[10]	5-17-28	.....	100	3½% s.-a. Feb. 1
Rockland-Rockport Lime 2nd pfd.[10]	5-17-28	.....	60	3% s.-a. Feb. 1
Rockland-Rockport Lime com.[10]	5-17-28	No market		1½% qu. Nov. 2
Sandusky Cem.	7- 2-28	204	.....	$2 qu. July 2
Santa Cruz P. C. bonds	6-29-28	105¾	.....	6% annual
Santa Cruz P. C. com.	6-29-28	90	92	$1 qu. Apr. 1
Schumacher Wallboard com.	6-29-28	17	18	50c May 15
Schumacher Wallboard pfd.	6-29-28	24½	25½	
Southwestern P. C. units[44]	6-14-28	270	.....	
Superior P. C., A[20]	6-29-28	47	48½	
Superior P. C., B[20]	6-29-28	33	36	
Trinity P. C. units[37]	6-29-28	150	157	
Trinity P. C. com.[37]	6-29-28	48	.....	
U. S. Gypsum com.†	7- 3-28	86½	87¾	40c qu. June 30
U. S. Gypsum pfd.	7- 5-28	127	.....	1¾% qu. June 30
Universal G. & L. com.[3]	7- 2-28	1	1½	
Universal G. & L. pfd.[3]	7- 2-28	.....	13	1½% Feb. 15
Universal G. & L., V.T.C.	7- 2-28	No market		
Universal G. & L. 1st 6's[3]	7- 2-28	.....	60	
Upper Hudson Stone 1st 6's, 1951[32]	12-28-27	92	.....	
Vulcanite P. C. 1st 7½'s[32]	12- 5-27	105	109	
Chas. Warner com.	7- 2-28	34½	37½	50c qu. July 10 & 25c ex.
Chas. Warner pfd.	7- 2-28	109	.....	1¾% qu. July 26
Whitehall Cem. Mfg. com.[36]	7- 2-28	150	.....	
Whitehall Cem. Mfg. pfd.[36]	7- 2-28	98	.....	
Wisconsin L. & C. 1st 6's[15]	7- 2-28	100	.....	
Wolverine P. C. com.	7- 5-28	6¼	6¾	15c qu. May 15
Yosemite P. C., A com.[46]	7- 2-28	6	7	

†10% stock dividend, July 10. U. S. Gypsum common holders of record July 14 have the right to purchase new common at $20 a share to the extent of 50% of holdings. Right expires Oct. 1. Payments of 25% are due: Oct. 1, 1928; Feb. 1, June 1, and Oct. 1, 1929. *Called for payment July 18 @ $110.

[1]Quotations by Watling, Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willet, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter and Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick and Co., Montreal, Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks, Chicago, Ill. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney Williams & Co., Inc., Los Angeles, Calif. [45]Tifft Bros., Pittsfield, Mass.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
Asbestos Corp. of Amer., 5 sh. pfd., 5 sh. com.[1]	$1 for the lot	.....
Atlanta Shope Brick and Tile Co[1]	25c	.....
Benedict Stone Corp. (cast-stone), 50 pfd., 390 com.[1]	$400 for the lot	.....
Benedict Stone Corp. 1st 7's 1934[8]	.....	86
Blue Stone Quarry, 60 sh.[2]	$10¼ for the lot	.....
Eastern Brick Corp., 7% cum. pfd.[1]	40c	.....
Eastern Brick Corp. (sand lime brick) com.[1]	40c	.....
International Portland Cement Co., Ltd., pfd.	30	45
Globe Phosphate Co., $10,000 1st. mtg. bonds, $169.80 per $1000 paid on prin.	$50 for the lot	.....
Iroquois S. & G. Co., Ltd., 2 sh. com., 3 sh. pfd.[1]	$12 for the lot	.....
Knickerbocker Lime Co.[4]	105	.....
Missouri Portland Cement Co., 7% serial bonds	104¾	104¾
Olympic Portland Cement Co.[7]	.....	£1⅝

Stock	Price bid	Price asked
Phosphate Mining Co.[1]	1	.....
River Feldspar & Mill'g Co., 50 com., 50 pfd.[1]	$200 for the lot	.....
Rockport Granite Co., 1st 6's, 1934	90	.....
Simbroco Stone Co.[2]	12	12
Simbroco Stone Co.,[9] 40 sh. pfd., par $50; 40 sh. com., par $10 (40 units)	$2 per unit	.....
Simbroco Stone Co.,[10] 10 sh. pfd., par $50	$10.25 per sh.	
Southern Phosphate Co.[6]	1¼	.....
Standard Gypsum Co., 10 sh. pfd., 5 sh. com.[1]	$35 for the lot	.....
Tensas Gravel Co., 180 sh. com.[1]	$1 for the lot	.....
Tidewater Portland Cement Co., 3000 sh. com.	$6525 for the lot	.....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	.....
Wabash Portland Cement Co.[1]	60	100
Winchester Brick Co., pfd., sand lime brick[5]	10c	.....

[1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price obtained at auction by R. L. Day and Co., Boston. [3]Price obtained at auction by Weilupp-Bruton and Co., Baltimore, Md. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, on April 4, 1928. [5]Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. [6]Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass. [7]Neidecker and Co., London, England. [8]Auction sale of $1000, Barnes & Lofland, Philadelphia, March 31, 1928. [9]Price at auction May 2, 1928, by Wise, Hobbs & Arnold, Boston. [10]Price at auction, June 6, 1928, R. L. Day & Co., Boston, Mass.

Riverside Cement Plea Granted

THE Corporation Department of California has issued permit to Riverside Portland Cement Co. to sell 5000 shares first preferred of no par value and 104,900 shares class B stock. The Riverside Portland Cement Co. has been authorized to distribute portions of capital assets of value of $10,533,692 to stockholders.

Riverside Portland Cement Co. Preferred Stock Offered

BLYTH WITTER AND CO. are offering at $100 and accrued dividends 65,000 shares of no par value $6 cumulative first preferred stock of the Riverside Cement Co., which was formed to take over the Riverside Portland Cement Co. and subsidiaries, important producers of cement in southern California. Proceeds from the sale of 5000 shares of this first preferred stock, which represents the only new financing by the company, will be used to retire the outstanding bonded indebtedness of the predecessor company and for other corporate purposes.

The preferred stock is preferred as to assets and cumulative dividends. Dividends payable quarterly, beginning in February. Redeemable all or part on any dividend date, upon 30 days' notice, at 105 if redeemed prior to July 1, 1938, and at 102½ thereafter, plus dividends to date of redemption. Entitled to receive the redemption price in event of voluntary liquidation, and entitled to receive $100 per share in the event of involuntary liquidation or dissolution. Stock transferable at the offices of the company, Corporation Building, Los Angeles, Calif., and 200 Bush Street, San Francisco, Calif. Bank of California, N. A., San Francisco, and Union Bank and Trust Co., Los Angeles, registrars. Dividends exempt from normal federal income tax under present laws.

Capitalization.—

	Authorized	Outstanding
1st pfd. $6 cum. div. stock (no par)	70,000 shs.	65,000 shs.
Class A $1.25 cum. partic. div. stock (no par)	240,000 shs.	240,000 shs.
Class B common stock (no par)	400,000 shs.	345,000 shs.

Company.—Has been organized in Delaware to acquire and operate the plants, properties and all other assets of the Riverside Portland Cement Co. and subsidiary companies which have been successfully engaged in the manufacture and sale of cement in southern California since 1910. The business constitutes one of the principal units of the cement industry in California, manufacturing over 3,000,000 bbl. in 1927, which represents approximately 22% of the total cement production in the state last year. This reincorporation and financing contemplates no change in operations or personnel.

Included in the properties of the company are two complete and modernly equipped plants having a combined daily capacity of 13,000 bbl. of cement, situated at Chestmore, near Riverside, Calif., and at Oro Grande, Calif., in the vicinity of Barstow. These locations are favorable from the standpoint of transportation facilities and proximity to both raw materials and centers of consumption. The developed and proven raw material resources owned by the company have been estimated as having tonnage sufficient to supply the plants for more than 50 years at the present rate of consumption.

Earnings.—The predecessor company has earned a substantial profit in each month since the beginning of operations in 1910. Consolidated net earnings for the six years ended December 31, 1927, after deduction of all charges, including depreciation, depletion and provisions for federal income tax, have average in excess of $1,500,000 per annum, or approximately four times the maximum first preferred stock dividend requirements and over three times dividend and sinking fund charges.

Sinking Fund.—Under the terms of the certificate of incorporation the company shall set aside in each year out of its net income, beginning March 1, 1929, a sinking fund to be used for the retirement of first preferred stock, by purchase in the open market, or redemption by lot at the call price. This sinking fund is calculated to retire the entire first preferred stock within approximately 29 years.

CONSOLIDATED BALANCE SHEET AS OF MAY 1, 1928 (AFTER THIS FINANCING)

ASSETS

Inventory	$1,381,589
Notes and accounts receivable	419,883
Cash in banks and on hand	1,351,948
Stocks, oil lands and other real estate, etc.	925,964
Deferred charges	43,968
Mineral lands, plants and equipment	8,000,854
Total	$12,124,207

LIABILITIES

Notes and accounts payable, including provision for federal tax	$828,877
Reserves	412,238
Capital	*9,552,500
Surplus	*1,330,592
Total	$12,124,207

*Represented by 65,000 shares no par value first preferred $6 per share cumulative stock; 240,000 shares no par value class A $1.25 per share cumulative stock; 240,000 shares no par value class A $1.25 per share cumulative, participating stock, and 345,000 shares no par value class B stock.

Lehigh Portland Cement Dividend

LEHIGH PORTLAND CEMENT CO. has declared a dividend of 62½ cents a share on the common stock. The dividend due in April on this issue was omitted. On February 1 a stock dividend of 100% was paid in preferred stock. Previous to that time the company had been paying 75 cents quarterly on the common. The dividend is payable August 1 to holders of record July 14.

Recapitalization of Ideal Cement Co. Approved by Stockholders

THE STOCKHOLDERS of the Ideal Cement Co. have approved the recapitalization plan. Directors declared the regular quarterly dividends of $1 per share on the common and $1.75 per share on the preferred stock, both payable July 1 to holders of record June 15.

The new common, to be issued two for one for the old, will be placed on a $3 annual basis starting with the October 1 dividend, which is equivalent to $6 a share annually on the old common, on which dividends of $4 a year were paid.

Marquette Cement Offering $500,000 New Bonds

HITCHCOCK AND CO., Chicago, Ill., are offering $500,000 first mortgage 5% gold bonds of the Marquette Cement Manufacturing Co., maturing October 1, 1941, to October 1, 1945. The same financial house has previously sold $3,000,000 of the same $5,000,000 authorized bond issue; and states "since April, 1926, the Marquette company has added materially to its fixed and current assets and is now making substantial additions and betterments to its plant at La Salle, Ill. After giving effect to the issuance of these additional $500,000 bonds, the balance sheet as of December 31, 1927, shows net tangible assets of $4225 for each $1000 bond, of which net current assets are $1390."

CONDENSED BALANCE SHEET AS OF DECEMBER 31, 1927

(After Giving Effect to the Issuance of $500,000 First Mortgage 5% Serial Gold Bonds Dated April 1, 1928)

ASSETS

Current Assets:		
Cash		$ 1,004,314.87
Government and municipal bonds		2,400,000.00
Cash surrender value of life insurance		13,318.24
Deposits with bids		20,000.00
Notes and accounts receivble	$493,023.87	
Less: Reserve	18,810.28	474,213.59
Inventory		1,262,116.30
Total current assets		$ 5,173,963.00
Investments		68,013.29
Fixed Assets:		
Plant and property		11,621,550.05
Deferred charges to operations		492,077.94
		$17,355,604.28

CAPITAL AND LIABILITIES

Current Liabilities:		
Accounts payable—current accounts only		$ 363,915.96
Accruals:		
Wages	$ 47,111.08	
General and federal income taxes	270,616.82	
Interest and expense items	42,325.07	360,052.97
Total current liabilities		$ 723,968.93
Funded Indebtedness:		
First mortgage serial gold bonds authorized $5,000,000:		
Issued and outstanding—6%		$ 2,700,000.00
Issued and outstanding—5%		500,000.00
		$ 3,200,000.00
Reserves:		
Depreciation and depletion		$ 2,542,357.63
Liability insurance		74,295.79
		$ 2,616,653.42
Capital Stock:		
Preferred—6% cumulative		$ 4,568,700.00
Common		3,441,200.00
		$ 8,009,900.00
Surplus		2,805,081.93
		$17,355,604.28

The average net earnings for the five years ending December 31, 1927 (after provision for depreciation, depletion and obsolescence) applicable to interest charges on the total bonds to be outstanding after the present issuance is in excess of five times the maximum interest requirements.

Iron City Sand and Gravel Co. Bonds Offered

THE Iron City Sand and Gravel Co. of Pittsburgh, Penn., has offered $1,100,000 in 6% bonds due in 1940. Townsend, Scott & Sons, brokers of Baltimore, and Stein Bros. & Boice, also of Baltimore, are making the offering.

National Gypsum Co. Issues New Bonds

THE NATIONAL GYPSUM CO., Buffalo, N. Y., has been offering $500,000 in new securities in the form of a sinking fund gold bond issue. The following information is given:

Interest payable semi-annually April 1 and October 1 at the principal office of the Manufacturers and Traders-Peoples Trust Co., Buffalo, N. Y., trustee. Coupon bonds in denominations of $1000 with privilege of registration as to principal only. Redeemable in whole or in part at the option of the corporation on any interest date on 30 days' notice at 105 to and including April 1, 1933; at 104 from April 1, 1933, to April 1, 1938; at 103 from April 1, 1938, to maturity together with accrued interest in each case.

The corporation agrees to pay interest without deduction for any federal income tax not exceeding 2% per annum which the corporation or trustee may be required or permitted to pay at the source, and to reimburse the holders of the bonds, upon proper application within 60 days after payment, for the Pennsylvania and Connecticut 4 mills taxes, the Maryland 4½ mills tax, the District of Columbia 5 mills tax and the Massachusetts income tax on the interest not exceeding 6% of such interest per annum.

Preferred stock is callable on 30 days' notice at $105. Dividends on the preferred stock are cumulative and are payable at the rate of 1¾% quarterly on the first days of January, April, July and October of each calendar year. Common stock A has no set dividends, but the charter provides that no dividends can be paid in any year on the B stock until A common has received $2 a share, when dividends up to $2 may be paid on B common. Class A and B participate equally, share and share alike, in all excess profits.

Capitalization (Upon Completion of Present Financing)

	Authorized	To Be Presently Issued
Fifteen-year 6% sinking fund gold bonds (this issue)	$1,000,000	$500,000
7% preferred stock ($100 par)	50,000 shs.	23,911 shs.
Common stock A (no par)	135,000 shs.	72,624 shs.
Common stock B (no par)	15,000 shs.	15,000 shs.

Properties—The National Gypsum Co. was organized under the laws of Delaware on August 29, 1925. The company operates two plants for the manufacture of fireproof wallboard, wall plaster, plaster base, insulation and other gypsum products for which there is a broad, staple demand. The plant at Clarence, N. Y. (near Buffalo) was completed in June, 1926. The one at National City, Mich., was completed and put into operation during May, 1927. The New York plant is located on a gypsum deposit owned or controlled by the company, estimated by the American Appraisal Co. to contain more than 9,000,000 tons or a sufficient supply of 50 years' operation.

At National City, Mich., the company owns in fee simple 1000 acres containing, according to the appraisal of the American Appraisal Co., over 30,000,000 tons or a supply sufficient to last more than 100 years. This is one of the only two gypsum quarry operations east of the Mississippi—all others mine. This results in an annual saving in cost compared with competition of about $125,000 on present production with proportionate increase as business grows. New York and Michigan plants include mine and quarry development for taking out the gypsum, mill buildings, calcining buildings, plaster warehouses and wallboard plants. The operation throughout is mechanical and continuous and represents the latest and most efficient method of manufacture.

Distribution—The National Gypsum Co. in less than three years has built the third largest gypsum and wallboard business in the United States. More than 1500 dealers in lumber and building materials handle its products which are now nationally advertised. The management, sales and producing organization have had many years experience with valuable contacts, which has made possible the operation of the business at a profit from the start.

Earnings—For the year ending December 31, 1927, net earnings available for interest, depreciation and federal income taxes were $180,132.43, or more than five times interest charges on this issue. If non-recurring charges of $46,730 are added such earnings are more than seven times interest charges. New York board plant operated full year. New York plaster plant started operating June, 1927. Michigan board plant started operating in May, 1927; plaster plant in August, 1927. Capacity during 1928 will be twice what it averaged in 1927; sales will be correspondingly greater. Sales for January and February, 1928, were more than twice the sales for January and February, 1927—this without giving effect to improvements and extensions now being made.

Asset Position—Balance sheet as of January 31, 1928, after giving effect to this financing, shows net assets of $6,184,786, or $6184 for each $1000 bond authorized and over $12,000 for each $1000 bond to be presently issued. Net current assets, after giving effect to this financing, are equivalent to $2200 for each $1000 bond issued.

Trust Agreement—The gold bonds are to be issued under a trust agreement which will provide among other things (a) that no mortgage or pledge of property shall be created except for purchase money mortgages, mortgages on property hereafter acquired existing at time of acquisition, renewals or replacements of such mortgages and pledges in the usual course of business to secure loans not exceeding one year, without securing these bonds equally and ratably with the obligations to be so secured, (b) that no bonds of this series may be issued unless (1) Earnings for previous fiscal year, before depreciation, interest and taxes are at least 4 times interest charges on bonds issued and to be issued, (2) Net tangible assets are at least 3 times face value of bonds issued and to be issued.

Sinking Fund—The indenture will provide for a semi-annual purchase fund commencing April 1, 1931, in amount sufficient to redeem annually 4% of the total principal amount of bonds of this series which shall have been theretofore issued to be applied to the purchase of bonds of this series if obtainable at or below the current redemption price or to the redemption thereof if not so obtainable. In lieu of cash the company may tender bonds of this series at the current redemption price.

Purpose of Issue—Proceeds from the sale of these bonds will be used for additional working capital to take care of increased business and for additionc and improvements.

Recent Dividends Announced

Alpha Portland Cement com. (quar.)	75c, July 14
Arundel Corp. com. (quar.)	50c, July 2
Lehigh Portland Cement	62½c, Aug. 1
Sandusky Cement com. (quar.)	$2, July 2
Chas. Warner 1st and 2nd pfd. (quar.)	25c, July 10
Chas. Warner com. (quar.)	1¾%, July 26
Chas. Warner com. (extra dividend)	50c, July 10

Southern Phosphate Earnings

THE SOUTHERN PHOSPHATE CO. reports earnings in 1927 (in table below).

The year 1927 is the first since 1921 in which the company has shown a profit after all charges.

Year ended December 31—	1927	1926
Gross profit	$302,479	$174,918
General and administration expense	38,431	42,822
Net income	$264,047	$132,096
Other income	13,861	14,514
Total income	$277,908	$146,610
Interest, taxes, etc.	23,571	36,787
Shutdown expense: standard, Lakeland and export plants	13,579	11,811
Depreciation, depletion, obsolescence and surplus adjustment	232,839	218,512
Net to surplus	$7,920	*$120,501

*Deficit.

Calendar Years	1927	1926	1925	1924
Net profit after depreciation and taxes	$230,606	$584,912	$536,498	$458,491
Bank and interest, rents, etc.	8,579	19,554	19,672	12,046
Total income	$239,186	$604,466	$556,170	$470,537
Deduct—Interest on bonds, etc.	9,375	6,539	8,149	15,631
Federal income tax for year	23,916	72,957	63,929	49,461
Norfolk property written off	.....	.....	.....	148,181
Loss on dismantling machinery, etc.	23,776	31,233	50,289	.....
Net income	$182,119	$493,737	$433,803	$257,264
Preferred dividends paid	(7%) 130,998	(26) 486,564	(17) 318,096	(14) 261,892
Balance, surplus	$51,121	$7,172	$115,706	def. $4,629
Shares of common stock outstanding (par $50)	22,085	22,108	22,121	22,126
Earnings per share on common stock	$2.31	$16.41	$13.69	$5.71

BALANCE SHEET DECEMBER 31

Assets:	1927	1926
Real estate, buildings, machinery, etc.	$2,914,988	$2,935,070
Cash	236,315	197,208
Notes and accts. receivable	66,949	142,259
Loaned on collateral demand notes	.....	50,000
Sundry debtors	2,875	3,051
Rents and interest receivable	495	939
Inventories	518,249	523,807
Deferred charges	15,535	25,646
Fund for redeeming bonds	19,657	29,960
Stocks and mortgages owned	6,022	6,404

Liabilities:	1927	1926
Preferred stock	$1,871,400	$1,871,400
Common stock	1,104,250	1,105,400
First mortgage 6's	89,000	100,000
Accounts payable	45,353	155,910
Customers' credit balance	1,064	2,381
Payroll and unclaimed wages	9,517	19,633
Accrued interest and taxes	26,116	76,359
Reserved for contingencies, etc.	18,757	18,756
Surplus	615,627	564,506
Total (each side)	$3,781,085	$3,914,345

A. S. T. M. Meeting Develops Important New Data

Committee Reports on Cement and Aggregates Have Definite Bearing on Future of the Industries

THE MEETING of the American Society for Testing Materials, at Atlantic City, N. J., on June 29, was one of the most important held, from the standpoint of the rock products industry. Some of the things that made it so are the report of the cement committee, which gives the work of many laboratories and which has taken about two years to prepare, and the report of the concrete aggregate committees, which includes a specification for concrete aggregates far more definite than any that a national organization has atempted to formulate, except it be the American Concrete Institute specification, which was not ready for publication at its last meeting. It is understood that the two specifications are practically identical, most of the members of one committee serving on the other committee as well.

Several of the papers read show a marked advance in the art of testing. Perhaps as important a paper as any in that respect was one by Edward C. Brickett, whose plastic mortar test gives promise of the possibility of testing cement in a way that will show its concrete-making value. A study of the abrasion test of gravel also gives promise, in that the method worked out by the committee on highway materials obviates some of the objections to the older methods. The papers on flexural strength testing, which cannot be reviewed here for lack of space to do them justice, are of especial importance to the producer of highway materials. The paper by H. C. Gonnerman and E. C. Shuman shows more clearly than was known before the relation betwen flexural and compressive and tensile strengths of concrete.

Report of Cement Committee

The report of Committee C-1, P. H. Bates, chairman, will take its place as one of the most important contributions to the literature of cement testing and laboratory practice. Forty-seven laboratories co-operated in the investigation, and the number of specimens broken in the strength test was more than 63,000. The laboratories were commercial, government, state and municipal, railroad, university, and those maintained by portland cement manufacturers, and every care was taken by these to see that the results were obtained by standard methods.

As the report states, the resulting data are disappointing both in respect to the wide variations in results obtained by the different laboratories and in respect to the lack of positive trends indicated. It is freely admitted in the report that laboratories do not obtain the concordant results that good commercial practice demands, and that whether a cement is meeting the requirements of the standard is now too frequently a matter of the choice of laboratories.

The advisory committee is studying the situation along the lines of establishing a central laboratory where instruction can be given by trained operators and where the equipment can be calibrated. This laboratory might also act as umpire in case of disputes between laboratories. In closing the discussion of the report Mr. Bates referred especially to this part of the report and seemed to hold that the establishment of some central authority was much needed.

Although the report has not yet been published, its effect on the industry has already been felt, for it has been discussed in group meetings and committee meetings, and so many laboratories participated that the results were more or less known throughout the industry. Much of the work was done two years ago and, as was brought out in the discussion, the discordant results obtained have already caused considerable improvement in method and practice. A repetition of the work would show better concordance in the results than was obtained at the time the tests were made.

In addition to this effect the report has caused a search for a method of testing that would give a better criterion of the concrete-making value of cement than the strength tests in common use. One method, that of making briquets from fluid mixes, was tried out by the committee and found disappointing. Another method, described in a paper presented at the same session, gives greater promise and the committee will carefully study the results in laying out a program for new work.

The report of the Cement Committee itself is too long and too detailed to be abstracted in any form that would mean much to the reader. There are 68 pages, many of them filled with closely printed tables. But a summary of some of the sub-committee's findings may give an idea of the nature of the work.

The sub-committee on definitions and chemical limitations, G. A. Saeger, chairman, found a fair concordance with chemical analyses from the different laboratories except on two cements. No curve could be drawn by which chemical values could be used as an indication of the concrete-making value of the cement, but the curves indicated that for 28-day concrete:

1. Ratio of SiO_2 to R_2O_3 increased as the strength decreased.
2. The lime-silica index decreased as the strength decreased.
3. Ratio of CaO to $SiO_2 + R_2O_3$ decreased as strength decreased.
4. The $3CaO \cdot SiO_2$ decreased as strength decreased.
5. The $2CaO \cdot SiO_2$ increased as the strength decreased.
6. The $3CaO \cdot Al_2O_3$ decreased as strength decreased.

The lime-silica index, the ratio CaO to $SiO_2 + R_2O_3$ and the $3CaO \cdot SiO_2$ curves seem to parallel each other throughout the series.

From the curves shown on one of the figures the following approximate equivalents can be calculated:

$3CaO \cdot SiO_2$	Lime-Silica Index	$\frac{CaO}{(SiO_2 + R_2O_3)}$
45.0	2.32	2.10
37.5	2.25	2.05
30.0	2.18	2.00

The sub-committee on fineness, J. C. Pearson, chairman, reported a fairly satisfactory concordance of fineness tests, on the whole, but found that individual determinations showed a considerable range in the residues on the 200-mesh sieve. The sub-committee thought that discordant results were mainly due to the use of uncalibrated sieves and failure to follow in detail the specified procedure.

The sub-committee on normal consistency found from a study of results that differences in the amount of water used in making a 1000-g. batch of 1:3 mortar were so slight that differences in briquet strength were not to be expected from this cause.

A plot of fineness and normal consistency showed some relationship, although the relationship was not exact.

The wide range of results in normal consistency showed the need of more care in following standard specifications. Differences seem to be due to personal equations of operators and differences in moisture and temperature conditions at the time of the test.

The sub-committee on time of setting,

F. W. Kelley, chairman, presented a long and very detailed report. One conclusion is that the obvious solution of the problem of testing for initial set lies in the selection of a time limit within which a penetration of less than the full depth of the needle should not take place. The penetration by the standard Vicat needle at 1 hr. is suggested as suitable. The committee has further tests under way intended to correlate the initial set with the behavior of concrete in the field.

The report of the sub-committee on strength occupies more than half the report and contains many tables and plottings. The summary alone takes three pages. A few of the conclusions, which are perhaps of the greatest interest, are: The grand average for individual laboratories which made 1:3 briquet mortar tests were 80, 90, 94, 103, 109 and 124% of the grand average for the six laboratories which made concrete strength tests.

Tests on cubes and briquets made with fluid neat cement did not warrant changing to another method of strength test.

Comparison of strengths from three types of cement test with the corresponding concrete strength showed that none of them possessed a marked advantage over the others as a criterion of concrete strength. Furthermore, no one of the three types of tests had the characteristics desired in a test for use as means of measuring the strength property of a cement in concrete.

One conclusion of the full committee report is that the strength requirements of the present A. S. T. M. standard are not too low. It is pointed out that some of the reputable laboratories making strength tests would have condemned some of the cements submitted, while so many other laboratories would have approved the cement as meeting the same requirements. With such evidence before it, some of the members of the committee feel that the society might have been even more tolerant in setting its requirements.

Plastic Mortar Test

The report of the cement committee pointed out the deficiencies of present cement tests to serve as a criterion for concrete-making value. The paper of Edward M. Brickett, engineer of tests with the Lehigh Portland Cement Co., introduced a method which, so far as it has been tried, promises to be much more satisfactory than present methods. The title of the paper is, "A Plastic Mortar Compression Test for Cement," and this is descriptive of the method.

The test pieces were 2-in. cubes made of 1 part of cement to 2.75 parts sand which was "fabricated" from four sieved sizes of sand finer than No. 8 mesh. The fineness modulus was 2.23. The amount of water was determined from the previously made concrete and calculated to give the same water-cement ratio as the concrete tested with it, disregarding absorption of water by the aggregates. Cubes molds were filled in two layers and rodded, a surplus being struck off two hours after pouring.

The concrete cylinders tested for comparison were made with great care from regraded aggregates. The water-cement ratio was approximately 1.00, or 7½ gal. per sack of cement, but varied slightly to make the consistency that would give an 80% flow, equal to about a 6½-in. slump.

The theory on which the test is based is the use of a water-cement ratio duplicating concrete in water content. The introduction of a graded sand was the next logical step and it was found that a satisfactory mortar could be made with the desired water-cement ratio which would be stiff enough to resist segregation in the molds and yet so plastic as to minimize the personal equation in puddling or rodding the specimens.

The report contains a number of curves and plats, in which results are compared with those obtained by the standard 1:3 mortar method and the fluid cement method. The plastic mortar method in all cases is shown to indicate the concrete making value of the cement much more faithfully than the other two.

The paper suggests that the method may be used as a basis of design. It also points out the possibility of using any clean sand (by regrading) in making the test.

Discussion

Discussing this paper, F. H. Jackson, U. S. Bureau of Public Roads, said he was not at all sure that any clean sand could be used. Apart from the grading the character of the grains effects the strength to be obtained to a remarkable degree.

He then went on to discuss the strength tests in the committee's report and gave as his judgment that the differences shown were due to faulty control of moisture and temperature. He thought all testing would be unsatisfactory until this handicap could be overcome; and he pointed out that results on eight cements varied as much as the variation that would have occurred with one cement by changing the water used 1½ gal. per sack of cement.

H. F. Gonnerman, Portland Cement Association, discussed the plastic mortar test, saying that its value lay in the use of a water-cement ratio like that of concrete. He criticized the paper for omitting the consistency of the plastic mortar used in the test. Mr. Brickett, in closing, admitted that this should have been included and gave the consistency as 56% for 30 drops of the flow table, that is, an increase in diameter from 100 mm. to 156 mm. The flow of the plastic mortar does not follow the flow of the concrete.

Mr. Gonnerman spoke of tests being made at the Portland Cement Association's laboratory along the same lines using Elgin, Ill., sand and a water-cement ratio of 0.9. The comparison with concrete tests promised much but some experiments were found to be "off" and it was his opinion that the method needed considerable study. An interesting point was that the plastic mortar test gave good results on cement from two mills included in the committee's report. The report showed the standard mortar strength of this cement did not show the concrete making value. He pointed out that one difficulty with using any sand for this test came from the fact that we do not really know what constitutes a structurally sound sand.

Discussing the committee report of strength tests, Mr. Gonnerman said that a special report on this was being prepared by the Portland Cement Association.

Prof. A. N. Talbot, University of Illinois, said that he wished to discuss the results of strength tests by letter. He thought that no present day test method could be considered wholly acceptable. Mr. Brickett's paper merely pointed the way. But he believed that if exact conditions had been faithfully maintained the results of the committee's strength tests would have shown much closer agreement. The effect of differences in the mixing and storing of test specimens is not wholly understood as yet.

P. H. Bates closed the discussion and again called attention to the need of a laboratory that would act as a central authority and train operators to go out into the field to train laboratory workers. He said that the whole effect of the work done for this report had been to greatly improve testing throughout the country.

Effect of Temperature on the Strength of Wet Concrete

In another session and discussing concrete and not cement testing, Prof. R. E. Davis, of the University of California, introduced some figures showing the results of comparatively small differences in temperature on wet concrete, which he said might have some bearing on the discordant results obtained in testing. Increases of temperature from 36 deg. to 140 deg. F. (the latter being about the temperature of paving on a hot summer day) showed remarkable differences in strength. Figures he gave were:

For 1:2:4 concrete: 4380 lb. at 65 deg. and 3200 lb. at 140 deg. a drop of about 27%.

For 1:3:6 concrete: 1760 lb. at 65 deg. and 1400 lb. at 140 deg., a drop of about 20.5%.

For 1:3 mortars, 7 days old, 1670 lb. at 36 deg., 1420 lb. at 140 deg. The same mortars 135 days old, 3310 lb. at 36 deg., 2820 lb. at 65 deg., and 2570 lb. at 140 deg.

These were all *water soaked* mortars and the same loss of strength had not been found with dry mortars.

Volume Change and Chemical Composition

"Volume Changes of Portland Cement as

Affected by Chemical Composition and Aging," was a paper presented by Prof. Alfred H. White of the University of Michigan. Prof. White has written many papers on volume changes in concrete, as he has been studying the subject for 26 years. But this, he said, is the first paper in which any effect has been made to correlate volume change with chemical composition.

The data given were drawn from a large number of examples, some of which were not commercial cements but special cements burned in a laboratory kiln. These included mixes up to 58% magnesia and cements containing lime and magnesia added in such a form that it would be free when the clinker was burned.

The effect of the free lime in one of these was shown by a rapid expansion for about a week after the bar was cast from it. In two weeks the effect was practically over. The free lime content was judged to be 2.75% and aging this cement reduced the free lime effect so that the expansion curve was normal.

The effect of magnesia on volume change was hardly shown with 1% magnesia at any time. With 3% it was very marked at the end of 4 yr., and still more marked with 4% after a 4-yr. period; after this a rapid expansion took place. Prof. White thought the reason for this was that the expansion was taken up by the voids in the cement at first. The 58% magnesia cement gave a normal expansion curve. It was too weak to be considered a commercial cement. The effect of free magnesia showed at once on a cement with 64% lime and 4.4% magnesia.

The smallest volume changes were found with cements high in iron and low in alumina. Synthetic cements with 6% iron were made that showed very small volume changes. Cements with high alumina contents showed a high volume change and the specimens were in bad shape. Commercial high alumina cements showed volume changes that were somewhat high, but the results obtained in the tests were conflicting.

The evidence seemed clear that it was impossible to make a cement that would not show some volume change, but that the lowest volume change was shown with cements high in iron and low in alumina. Prof. White thought the present limits of permissible magnesia content were "a little bit dangerous," since the volume change caused by magnesia often did not show up until a number of years had passed.

Discussion of Volume Change—Iron Ore Cements

The discussion of Prof. White's paper was opened by Dr. R. H. Bogue, who is conducting research on the constitution of portland cement at the Bureau of Standards for the Portland Cement Association. He was able to throw some light on the reasons for the low volume change with high iron cement. He also said that it was only until recent years that there was a method known for determining free lime, which hampered earlier investigators of volume change.

Of late, he said, the compounds that may be present in a system of equilibrium equivalent to portland cement have been studied and understood. Prof. White seemed to think that magnesia was thrown out by lime. It could be shown that both entered into a compound containing four parts of lime, two of magnesia, one of alumina and two of ferric oxide. Usually the formation of this compound was limited by the amount of ferric oxide present. There was low iron in some of the samples Prof. White tested, and hence the free magnesia.

Some of the experiments indicated that if the cement had been burned to equilibrium no free lime would have been present. The magnesia content of some of the cements tested was greater than that of any of the 32 cements tested by the committee on cement, reported at this session. The tests of Prof. White showed very nicely the effect of free lime and free magnesia on volume change, but the contents were more than would be found with commercial portland cements.

H. E. Brown, consulting engineer, New York, said that the characteristics of so-called iron ore cement had been pointed out in a paper by him published more than 15 years ago. The effect of sea water had been found less disintegrating to this than to ordinary portland cements. If expansion and disintegration are related, a high value should be placed on cements with a high iron content.

The objections that had been made to high iron cements were, first, the slow action in setting and hardening, and, second, the dark color. The slow action he thought could be improved by the use of suitable accelerators, and the dark color would not be objectionable in many cases.

Discussing cements in general, Mr. Brown said that relatively large amounts remained unhydrated in concrete, and that there were low cost salts which reduce surface tension, which might be added to increase the hydration.

He thought a low lime content was desirable. What is wanted is a high content of calcium tri-silicate. There is plenty of evidence that better cements are wanted and this is shown by the finer grinding, better burning, and the incorporation of salts to reduce surface tension, which are now a part of many manufacturing methods. But he thought that there are many dangers in the use of quick-hardening cements, although these may not become apparent for many years.

Effect of Aggregates on Volume Change

Prof. R. E. Davis, University of California, said that studies of volume change were being made at the University of California, where 350 bars, 3 in. square and 40 in. long, were under observation, constant conditions of heat and moisture being maintained. These bars were of concrete and the effect of grading of aggregates, water-cement ratio, and alternate wetting and drying were being studied.

It appeared from the work so far done that, other things being equal, shrinkage varied with the fineness modulus of the aggregate. Shrinkage with crushed gravel and crushed stone were found about equal, but the shrinkage was greater with natural gravels. Mortar used for bricklaying showed shrinkage in the laboratory test, but swelled in the wall. This, he thought, was due to the moisture in the mortar first going into the brick and then being reabsorbed by the mortar with more hydration of the mortar cement.

[Note that Prof. White's experiments on neat cement show volume change due to expansion, while tests on concrete showed volume change due to shrinkage.—Editor.]

In closing, P. H. Bates said that the good points of iron ore cements might be admitted, but they had been found difficult to manufacture in a commercial way. There were formerly four mills making it in the United States. Two had gone out of business altogether and the others were now making ordinary portlands. The largest series of tests ever made on the effect of sea water was made with these cements, and they stood very well.

Effect of Sulphate Waters

An important paper was presented by D. G. Miller, drainage engineer of the Bureau of Public Roads, on "Resistance of Portland Cement Concrete to the Action of Sulphate Water as Influenced by the Cement." It was shown that there was a wide difference in the action of sulphate water on the 12 standard portland cements tested, some of them disintegrating rapidly, while others stood up well. But the data were not sufficient to permit positive conclusions to be drawn. There was some evidence to show that cements high in alumina were less resistant.

Lime and Gypsum Reports

The lime committee, C-7, of which H. C. Berry is chairman, presented a brief report containing several revisions of the standard test methods for plasticity and absorption. Tentative definitions for quicklime and hydrated lime were suggested. The report was accepted without discussion.

The gypsum committee, C-11, of which J. W. Ginder is chairman, reported a tentative standard for Keene's cement and a new tentative standard for dental plaster.

It was proposed to advance the definitions for plaster board and wall board to standard, but this was not done. The definitions for molding plaster, pottery plaster and Keene's cement were advanced.

New Specification for Concrete Aggregates

The most important part of the concrete committee's report, Cloyd M. Chapman, chairman, was the introduction of a new tentative standard for concrete aggregates. The same specification was a part of the report of Committee D-4 on highway materials. This specification goes much further than previous specifications in setting limits for deleterious substances and for grading.

The specification proposes the following limits for deleterious substances in fine aggregates:

	Pct. by weight
Removed by decantation	3
Shale	1
Coal	1
Clay lumps	1

The limits for alkali, mica-coated grains and soft and flakey particles are left open. It is recognized that under certain conditions limits even less than those given above should be specified.

Grading of Sand

The recommended grading of sand is:

Passing a ⅜-in. sieve	100
Passing No. 4 sieve	85-100
Passing No. 16 sieve	45- 80
Passing No. 50 sieve	2- 30
Passing No. 100 sieve	0- 5

It is recognized in a note that these may have to be altered to meet local conditions.

In case the concrete resulting from using aggregates with extreme limits of grading is not sufficiently workable, it is permitted to use a fine aggregate with a greater percentage of fine materials, or a coarse aggregate having a smaller percentage of fine material.

The mortar strength test, regarding which there has been so much discussion, has been retained, and the requirement is the usual 100% of the strength developed by Ottawa sand under the same conditions.

The colormetric test is also retained, and it is recommended that sands showing a darker color than the standard be rejected unless they pass the mortar strength test.

Coarse Aggregates

The maximum amount of deleterious materials permitted in coarse aggregates will be, according to the proposed specification:

	Pct. by weight
Removed by decantation	1
Shale	1
Coal	1
Clay lumps	1
Soft fragments	1

The limits are left open for local deleterious substances such as alkali and friable, thin, elongated or laminated pieces, and it is recognized, as with fine aggregates, that under certain conditions maximum limits even lower than those proposed should be specified.

The sum of shale, coal, clay lumps and soft fragments shall not exceed 5%.

There was no comment in open meeting on these limits, but some who attended expressed the opinion privately that they should be changed. The limit of 1% on shale is one that both some stone quarries and gravel pits would find it difficult to meet, and the limit of 1% on clay lumps is considered too low. It is probable that either or both of these may be changed before the recommended specification becomes adopted as a tentative standard.

The abrasion test is considered necessary, but the committee says frankly that not enough is known about this test to allow limits to be set. As to soundness, the committee recommends that a "suitable soundness test" be applied and that aggregates failing to pass it be given a freezing and thawing test.

Weights of aggregates are not specified except for slag. It is recommended that a weight of 65 lb. per cu. ft. be specified for slag for base concrete and 75 lb. for slag for surface concrete subject to abrasion.

Grading of Coarse Aggregates

The recommended grading for coarse aggregate is:

			Pct. by weight
Passing maximum size screen		not less than	95
Passing screen	intermediate size	not less than	40
	½ maximum size	not less than	75
Passing screen	intermedite sizes	not less than	—
	as needed	not more than	—
Passing No. 4 screen		not more than	0 to 10

A note says that where a range of sizes is shown the engineer should use an appropriate percentage within the limits recommended.

The methods of sampling and testing aggregates are very clearly set out. All of them are methods which have been adopted as tentative or standard methods of the society. They cover sampling, sieve analyses, decantation test, test for organic impurities, mortar strength, compressive strength, soundness, freezing and thawing, testing for shale and coal, soft fragments, moisture and the application of the standard abrasion and durability tests.

The report recommended the advancing to standard of the test methods for apparent specific gravity, percentage of voids and surface moisture. These are the methods which use the Chapman flask.

The committee co-operated with Committee D-4 on the abrasion test for gravel which will be found under another heading.

Papers of interest to both cement and aggregate producers were presented in the concrete session which will not be reviewed here but which will be reviewed in later issues. These are:

"The Determination of the Workability of Concrete," by W. F. Purrington and H. C. Loring.

"The Measurement of Workability of Concrete," by G. A. Smith.

"Compression, Flexural and Tension Tests of Plain Concrete," by H. F. Gonnerman and E. C. Shuman.

"Some Accelerated Freezing and Thawing Tests on Concrete," C. H. Sholer.

"Effect of Several Mechanical Features of Testing on the Determination of the Flexural Strength of Plain Concrete," by T. F. Willis and F. N. Wray.

Of these, the paper most interesting to aggregate producers is that of Prof. Scholer on freezing and thawing tests. The work was undertaken to discover the causes of disintegration of bridges and other structures in Kansas and the cause was found to be unsound limestone aggregates which did not resist alternate freezing and thawing. Reference was made to the paper by G. F. Loughlin published in the March 17, 1928, issue of Rock Products for an explanation.

Abrasion Test of Gravel

Committee D-4, on highway materials, Julius Adler, chairman, made a study of its proposed abrasion test for gravel and the results are given in its report. Gravels from Portsmouth, Zanesville and South Columbus, Ohio, were tested and the four laboratories that ran tests checked each other very well. The method was that which has been proposed by the committee as tentative. It uses the standard Deval cylinder and six cast-iron balls, 1⅞ in. in diameter weighing approximately 0.95 lb. each.

The feature of the test that is new is the preparation of the sample by screening and recombining the sizes into one of four gradings. The grading nearest the gravel to be used as aggregate is chosen. A 5000-g. sample is then put in the cylinder with the ball charge and rotated at 332 r.p.m. for 10,000 revolutions.

In this method the calculation of the percentage of wear is different for uncrushed and crushed gravel. Wear on uncrushed gravel is calculated from th amount passing a 12-mesh screen. Fo crushed gravel the percentage of wear is figured by a formula. An interesting point about this test is that the committee considers crushed gravel to be any gravel with more than 10% of crushed fragments, and a note appended further says that a crushed gravel fragment may be considered a fragment of gravel having at least one fractured face.

The committee's report contains a number of tables showing the variations from

the mean obtained in this method of testing, which are rather less than one would expect them to be when the difficulty of obtaining check samples is taken into account. The important feature of this test is that with the gradings chosen there does not seem to be any serious variation due to grading.

Abrasion Tests on Different Coarse Aggregates

The effect of grading on the ordinary abrasion test was gone into very thoroughly in a paper by Stanton Walker, head of the engineering and research division of the National Sand and Gravel Association. The results were taken from a large number of abrasion tests made while he was in the Structural Materials Research Laboratory of Lewis Institute. Gravel, crushed limestone, granite, sandstone and slag were all tested.

Mr. Walker's conclusion was that the change in fineness modulus, before and after the abrasion test, was an excellent method of determining the percentage of wear as it took into account more than one screen size. However, the curves he showed were much the same when the percentage of wear was measured by weighing the portion of the abraded sample that passed a 14-mesh screen. Several factors were found to vary the wear. Wear was decreased by increasing the weight of the sample tested. The grading also varied the wear. In one case the wear was increased from 1.5% to 7.5% by increasing the fines from 0% to 50%. For angular particles the percentages of wear were greatly decreased if they were rounded before beginning the test.

A conclusion that may possibly point a way to testing for uniformity in gravel and the amount of soft pieces present is that the rate of wear varies with different gravels. Where soft pieces are present the rate of wear is rapid at first and then slows down. For harder and more uniform materials the rate is practically constant throughout the test.

This paper was discused by F. H. Jackson of the United States Bureau of Public Roads, who pointed out that the Deval test had been steadily used for 40 years in spite of the fact that it was in some ways unsatisfactory, even as applied to crushed stone. As used with aggregates, it is an indirect test for soundness. As applied to gravel it is obvious that it should be applied in such a way that the results obtained will be comparable with the tests from crushed stone, and the work of the committee (D-4) had been toward such an end.

He described some experiments made by the Bureau of Public Roads, in which fragments of crushed stone had been made into an artificial gravel by running them in an ordinary brick rattler until the corners were rounded. When this material was tested with iron balls in the Debal machine (Rea's gravel test) it was found to give a wear percentage that was actually lower than that of natural gravel tested under the same conditions. This was because the impact action was not so severe on fragments prepared in this way, and also because the material was more uniform.

The weakness of this test is that it does not bring out the uniformity of gravel, and a suggested modification would do this by running a second test on the coarse residue of the first test.

Alternatives to the abrasion test are the static load test and the impact test applied to separate pieces of gravel. The static load test has been developed to where it gives fairly good results by the state highway department of Iowa, and the impact test has been similarly developed by the Bureau of Public Roads. There seems to be the need of some test such as the abrasion test described, but, he pointed out, there are highways of gravel concrete which are in excellent shape, although the material of which they were made showed high wear in the abrasion test.

Bituminous Paving Materials

A recommended practice for bituminous paving plant inspection was adopted as a tentative standard, and this covers the sampling and testing of aggregates, filler and bituminous material used in paving. Much of this report only indirectly affects the producers of aggregate. In the sections which do affect him the methods of sampling and testing are those which have already been adopted by the society as applicable to all classes of aggregates. A special method is given for the mechanical or screen analysis of screenings from crushed stone plants. This first determines the portions on and through a 10-mesh screen, and if the amount passing this screen is greater than 100 g. (of a 250-g. sample) this portion is to be subjected to the society's standard mechanical analysis of sand.

Definitions Adopted

The committee on nomenclature (E-8) tried to have the definitions of screen, sieve, sand, and aggregate advanced from tentative to standard, but succeeded only with the definition for sand. Chairman Crum of Committee D-4 said that his committee already had tentative definitions for the others and the committee would need time to withdraw them before adopting the new definitions. So the motion to advance to standard was defeated, although it was by a rather close vote.

The definition for sand is one about which there has been considerable argument in times past, the producers of natural sand holding that only natural sand should be called "sand" without a prefix. It appears the committee agreed with them, as the definition adopted is: "The fine granular material (usually less than ¼ in. in diameter) resulting from the natural disintegration of rock or from the crushing of friable sandstone rock." The concluding clause was evidently inserted to include silica sand in "sands." A note says that "Sand should be distinguished from gravel, screenings, etc.," and it mentions that the fine material resulting from crushing blast furnace slag is known as "slag sand."

Later the committee attempted to have the definition of concrete advanced to standard, but Committee D-4 again objected. The objection was over the use of "concrete" by itself, which Committee E-8 thought should always refer to portland cement concrete. Committee D-4 said that the word concrete should always be used with a prefix, which is stated in its own tentative definition. The whole matter was finally allowed to go over until another meeting.

"Brick" Is a Brick

The definition of brick was more fortunate, as it was adopted as standard without opposition. Any kind of brick, as sand-lime or concrete brick, may be called "brick" by the terms of this definition, although a note states that a "unit of burned clay or shale" is generally meant when the word brick is used without a qualifying adjective.

The committee D-8 on waterproofing and road materials offered revisions for slate-surfaced roll roofing and shingles specifications. The words "granular minerals" are to be used in place of "slate surface" in order to include granules of other rocks than slate.

New Oklahoma Quarry Plant in Operation

SPENCER BROS., Columbia, Mo., began operation of their new crushing plant near Mangum, Okla., early in June. The plant has a capacity of 25 cars daily. It is one of the finest plants of its kind to be found anywhere. The crusher is of the latest make and is superior in construction to anything ever built in the past anywhere. The power is generated by their own electric plant which will have a 250-hp. capacity. The motive power is a gas engine and will be fed by gas brought from the Mid-West gas lines at Blair.

Mr. Spencer informed the reporter that they have a contract already to furnish the Orient railway with a million yards of crushed rock to be used in ballasting the entire line of Orient tracks. They expect a large commercial business, already having inquiries from several adjoining states.

The electric work on the big power plant was done by John Cunningham of the firm of Cunningham and Collier, Mangum. J. E. McKee and A. E. Jacobs of Mangum are interested with the Spencer Bros. in the industry. Spencer Bros. own another crusher at Columbia, Mo.—*Mangum* (Okla.) *Star.*

Blaine S. Smith to Be President of Pennsylvania-Dixie Cement Corp.

One of the Most Popular of the Younger Generation of Cement Industry Executives

IN the recent election of Blaine S. Smith to the presidency of the Pennsylvania-Dixie Cement Corp. the cement industry has demonstrated again that there is plenty of room at the top for the purposeful and industrious man, even though he may start in a humble capacity.

When the announcement was make in New York on June 26 that Mr. Smith had resigned as vice-president of the Universal Portland Cement Co. to become president of the Pennsylvania-Dixie, the news quickly found its way to Mr. Smith's friends. On first thought they were surprised, for Blaine Smith had always been considered as belonging to Chicago; on second thought, however, the news seemed to conform exactly with Mr. Smith's reputation as a climber, and it has been accepted on that basis everywhere.

To many young men who have felt handicapped for the lack of a college education, Mr. Smith's rapid rise furnishes inspiration of the most helpful sort. After working his way up from office boy to a position of considerable responsibility in the traffic department of the Chicago and Northwestern Railway, he went with the Universal Portland Cement Co. as an assistant in the sales department.

That was in 1908. It has been told by some of his fellow workers at that time that he came equipped with nothing more than a suitcase and a determination not to take "no" for an answer. It was soon discovered that the good-natured, youthful-looking addition to the department was the "go-getter" of the organization, and in the short space of a few months he climbed to the position of division sales manager in charge of one of the most important of the company's sales areas.

Within seven years he had risen to the position of general sales manager and as such earned a reputation for efficiency in

Blaine S. Smith

organization and sales work which has few parallels in the history of portland cement. In recognition of his splendid achievements Mr. Smith was later elected vice-president of the Universal Portland Cement Co. Now, in his early forties, he assumes the executive duties of one of the largest cement companies in America.

In addition to his interest in matters related to the selling of cement, Mr. Smith has always maintained a lively interest in manufacturing activities. Mr. Smith has been a leader in the movement for industrial safety, and in 1926, while president of the Portland Cement Association, he dedicated the association safety trophy won by the Duluth plant of his company for operating throughout 1925 without a lost-time, personal injury to an employe.

Mr. Smith is a member of the American Society for Testing Materials, American Concrete Institute, Western Society of Engineers and other organizations devoted largely to the problems of manufacturing and using portland cement.

For many years Mr. Smith has held positions of highest responsibility in the broad fields of the entire American cement industry. He served as chairman of the committee on advertising of the Portland Cement Association for three consecutive years. Later he served as vice-president of the association for two years (1923 and 1924). At the association's annual meeting of November, 1924, Mr. Smith was elected president of the association and chairman of the board of directors, to which positions he was re-elected the following year. At the present time Mr. Smith is a director and is chairman of the committee on elimination of waste in selling of the association.

Blaine Smith is well known in Chicago as an exponent of the city's civic as well as commercial and industrial interests, and in all of these connections his attention has reached out to state and nation as well. He has served as chairman or member of many

committees of the Chicago Association of Commerce and as general secretary and vice-president of that organization. Mr. Smith is a director of the Illinois Chamber of Commerce and of the National Bank of the Republic of Chicago.

In his new activities as president of the Pennsylvania-Dixie Cement Corp. Mr. Smith succeeds John A. Miller, who becomes chairman of the board of directors. When the Pennsylvania-Dixie organization was formed to take over the business formerly conducted by the Clinchfield, Dixie, Dexter, Penn-Allen and Pennsylvania cement companies, the late Richard Hardy became chairman of the board and John A. Miller, who had been president of two of the former companies, became president.

The Pennsylvania-Dixie Cement Corp. operates mills at Kingsport and Chattanooga, Tenn., and Grovania, Ga., in its southern district, and at Nazareth (two mills) and Bath, Penn., and Portland Point, N. Y., in its northern district. The capacity of its seven modern mills is approximately 11,000,000 bbl. of portland cement annually.

Mr. Smith's genial personality and absolute genius for serving are qualities which have won for him a host of friends. For years he has been known as one of the best informed men in the industry and by many of the leaders his counsel has been considered indispensable on all matters of importance.

The good wishes of ROCK PRODUCTS, along with those from a multitude of other friends, go with Mr. Smith in his new relationship.

Bessemer Cement to Build Plant in Chicago District

A SUBSTANTIAL INTEREST in Peerless Egyptian Cement Co., operating three plants in Michigan, at Detroit, Port Huron and Union City, with an aggregate annual capacity of more than 3,000,000 bbl., has been acquired by Bessemer Securities Corp., Youngstown, Ohio. The Bessemer Securities Corp. owns control of Bessemer Limestone and Cement Co., with an annual capacity of 1,500,000 bbl., and Federal Portland Cement Co. at Buffalo, with about the same capacity.

L. A. Beeghley, president of the Bessemer Limestone and Cement Co., has been named chairman of the Peerless Egyptian Cement Co., the balance sheet of which shows gross assets of about $10,000,000.

Mr. Beeghley and his associates own the Standard Slag Co., which has a wide-flung string of slag crushing plants connected with various blast furnace properties in the Middle West. Their Buffalo cement property is connected with Bethlehem Steel Corp. and it is expected that they will enter the Chicago district with a cement plant with steel corporation connections.—*Wall Street News* (New York).

F. L. Stone Made General Sales Manager of Universal Cement

APPOINTMENT of F. L. Stone as general sales manager of the Universal Portland Cement Co. has been announced by B. F. Affleck, president. He succeeds Blaine S. Smith, who recently resigned to become president of the Pennsylvania-Dixie Cement Co., as noted elsewhere in this issue.

Now in his eighteenth year with the Universal company, the new general sales manager started as a salesman. He later became successively chief clerk, assistant sales agent and division sales manager. For the last ten years he has been assistant general sales manager.

F. L. Stone, new sales manager of the Universal Portland Cement Co.

Becoming a Chicagoan in 1911, Mr. Stone had previously been in newspaper work in Denver, Colo., and life insurance at Charlotte, N. C. His business life started with the New York Telephone Co. in New York City, where he lived about 13 years.

Mr. Stone was born at Camden, Ark., and was educated at the University of the South, Sewanee, Tenn., and at the United States Naval Academy, Annapolis. He is a member of the Chicago Club, Hamilton Club, Executives Club, Indiana Society, Exmoor Country Club and Kappa Sigma fraternity.

Penn.-Dixie-North American Cement Merger Abandoned

AT A MEETING of the board of directors of the Pennsylvania-Dixie Cement Corp. June 22 it was decided that, because of the insufficient number of North American Cement Corp. sinking fund gold debentures series A 6½%, which have been deposited under the agreement of consolidation, the proposed consolidation of the Pennsylvania-Dixie Cement Corp. and the North American Cement Corp., which was approved by the stockholders of both corporations, will not be carried out.

It was announced that in the early part of July, John A. Miller, now president, would become chairman of the board of directors of the Pennsylvania-Dixie Cement Corp. and Blaine S. Smith would become president. Mr. Smith has been for many years sales manager and more recently vice-president of the Universal Portland Cement Co., Chicago.

Joseph Reeback Elected Secretary of Rockwood Gypsum Lumber Company

JOSEPH REEBACK, former general manager of the Higginson Manufacturing Co., Newburgh, N. Y., has been elected secretary of the recently incorporated Rockwood Gypsum Lumber Corp., of New York City. Mr. Reeback retired from the Higginson Manufacturing Co. when it was purchased by the Universal Gypsum and Lime Co.

He is a lawyer and was associated in law practice with Robert H. Barnett for several years, until Mr. Barnett became president of the Higginson Manufacturing Co. Mr. Reeback then became interested in the gypsum industry also, and was the head of the company's operating department in Nova Scotia and Newburgh.

Declining offers of a post in the corporation which purchased the local plant, Mr. Reeback, who had long been studying the Rockwood proposition, undertook a prominent part in the organization of the New York company, a licensee of the Rockwood Corp. of America, holder of patent rights covering the material.

A distinguished characteristic of Rockwood gypsum lumber, a new departure in building practice, is that it makes possible reinforced, gypsum, concrete construction without the use of forms. Great economies are claimed for this process.

Rockwood gypsum lumber makes possible construction of fireproof, reinforced gypsum concrete dwellings at a cost that is practically that of present non-fireproof methods, its manufacturers assert. It is also available for other types of buildings. Hundreds of homes constructed of "Rockwood" have been built in St. Louis, Mo., within the past three years.

Mr. Reeback for the present is retaining his home in Newburgh, but he expects soon to move to New York, where the offices of the company are located.—*Newburgh* (N.Y.) *News.*

["Rockwood" gypsum lumber, we presume, is a trade name similar to "rockwall"—and is no relation of Rockwood of ROCK PRODUCTS. This explanation may be entirely unnecessary; but this ROCK PRODUCTS' Rockwood was once accused of owning the Rockwood Silica Co., of Michigan. His financial interests in the rock products industries are at present confined to a part ownership of ROCK PRODUCTS.—The Editor.]

Why Some Trade Associations Fail

IN MAKING an analysis of the causes of the failure of some trade associations to fully realize their opportunities, E. St. Elmo Lewis, counsel in trade and consumer relations, National Services, Inc., of Detroit, a business analyst of international reputation, who has made a special study of trade associations, recently said to an industrial group:

"There are among the main causes for trade association failures:

"(1) Failure to realize that a trade association is a business with unique problems of economic and human relationships, and that there is a special technique and experience necessary in organizing and conducting a trade association, just as there is in any other 1928 business activity.

"Nearly 40% of trade associations fail to produce tangible results for this reason.

"(2) Failure to make a proper analysis of 'the job to be done' by the trade or industry, which means fixing the relative positions and tendencies of the trade; listing the various abuses and difficulties which retard its profitable progress; thus finding the trade problems common to the members as a basis of the association program.

"This is among the causes of 70% of the failures.

"(3) Failure to realize the necessity for both administrative and executive leadership, thus putting the work of the association in the hands of cheap, incompetent, time-serving men who waste time and money in theoretical futilities or the selfish pursuit of personal ends.

"Successful associations are invariably those that have set up their plans of organization, and program of operations only after the most careful analysis to determine the real situation in and out of the trade—and then let such facts lead them to practical decisions.

"(4) Failure to realize that busy men will not and can not give the time necessary to working out the details of association operation—no matter how great their personal interest—and thus fail to provide for the selection and maintenance of a competent staff necessary to skilled execution of well-defined and considered policies.

"The most successful associations are asking members to do little but pass on policies and results—leaving the execution to paid staffs.

"(5) Failure to realize that the job of a trade association executive is not a sinecure for a friend or a refuge for a business failure.

"Associations are rapidly getting away from this early mistake. Associations of outstanding success are invariably manned by skilled, specially trained executives who have displayed definite qualities of leadership.

"(6) The trade association fails whose membership expects its sales problems to be solved, its competition to become enlightened, its technical education to be developed, its public to become informed, at no greater annual charge to each member than the expense of a salesman's evening entertainment of a first-class prospect.

"The business leaders who have developed successful associations know that budgets are fixed by the plan of work, and they cannot afford to employ a cheap staff. Compensation is going up.

"(7) The trade association fails that spends its money and time trying to evade the price-fixing provisions of the Sherman anti-trust act, and thereby hoping to make real co-operation in the development of its markets, the education of the membership in better business methods, unnecessary.

"The Federal Trade Commission and court records demonstrate the futility of handling such trade problems in a spirit of a fighting resistance to public opinion. Successful trade associations guide and develop a favorable public opinion.

"(8) The trade association fails that exhausts its co-operative effort in passively 'resoluting,' or in drawing up vague ethical 'creeds,' or in formulating Codes of Practice that are impractical, or that expects by merely displaying practical codes on office walls it can automatically eliminate all the human cussedness that makes a warfare of business.

"Successful associations have found ways to make codes effective in raising the standards of practice.

"Practice" More Important Than "Codes of Ethics"

"(9) The trade association fails when it does not furnish practical working data on production, finance, marketing, merchandising, advertising, sales, and general business control—and specialists who can interpret the data in such a way as to give each member a true picture of the tendencies in the whole trade and his relation to them.

"Successful associations have developed affirmative, constructive programs of helpfulness in all functions of a business.

"(10) The trade association fails that does not realize in fixing its plans of organization and program of operation, and in selecting its executive personnel, that the effective trade association is a co-operative method of furnishing skilled staff guidance to the entire trade in the keen competition between trades for a share of the Consumer Dollar.

"The most successful associations are all staffed by specialists in the different business problems that research and analysis have shown to be important in the effort to maintain profits and the relative place of the trade.

"(11) The trade association fails that stops at the golf-playing, good-fellowship stage, however much friendliness helps at every stage of a more practical program.

"The demand for practical results and the reorganization of associations prove this.

"(12) The trade association fails whose members do not 'play the game' because they are 'too big and don't have to,' or 'so little it does not matter.'

"Otherwise the association is a futile gesture.

"(13) There are four things every trade association must do—

"(a) It must have an aggressive, faithful and competent leadership and a membership loyal to the purpose and plan.

"(b) It must have a plan of action on a competent, unbiased analysis of the trade's requirements.

"(c) It must have an adequate and competent staff to do the work.

"(d) It must have a program that realizes the necessary time, and a budget that fully covers the expense of putting the plan into execution."

North Carolina Mining Industry

THE report, entitled "The Mining Industry in North Carolina During 1926," outlining briefly the status of the industry in that state has been received. There are included short reports on the mineral deposits investigated during the year and extracts from reports which are out of print referring to important mineral deposits.

The mining and quarrying industries are in a more prosperous condition than ever in the history of the state. The heavy clay products such as brick, tile, pottery and wall coping, continue to lead in total production with a value of $4,235,653, while the stone, granite, trap, limestone and marble, come second with a total value of $4,140,828. Sand and gravel continues third with a total production of 1,434,839 tons valued at $968,201. Coal production for 1926 was valued at $243,000. Mining operations for metallic minerals such as iron, gold and silver are few.

The bulletin contains 63 pages included in which are several pages of statistics pertaining to the state industry. H. J. Bryson, state geologist for North Carolina is the author. Copies can be obtained from the North Carolina Dept. of Conservation and Development, Raleigh, N. C.

Two Import Changes in Duties on Imported Rock Products

Sand Used for Glass and Flux Purposes Held To Be Dutiable

THE BUREAU OF CUSTOMS in a ruling made public June 16, has directed the classification of so-called Belgian sand and other sand of that character as dutiable at $4 per ton under paragraph 207 of the Tariff Act of 1922, thereby distinguishing between sand used for glass and flux purposes and that employed in structural operations. This latter sand always has entered free of duty and the placing of the finer grades of sand in the general classification of crude silica represents a reversal of the position which the bureau had heretofore taken with respect to this commodity.

Domestic interests had protested against the free entry of Belgian sand, claiming it to be dutiable as crude silica and the bureau sought advice from the Geological Survey and the Bureau of Standards. The replies, which were quoted in the bureau's ruling, supported its position now announced, its statement said.

Following is the full text of the ruling which was in the form of a letter to the collector of customs at New York:

Sir: The department is in receipt of your letter of the first instant, in which reporting upon its reference to a letter in regard to the classification of Belgian sand you inclosed a report from the appraiser at your port who states that following the department's letter of December 16, 1922, he would advisorily return Belgian sand as free of duty under paragraph 1675 of the Tariff Act of 1922, which provides for the admission free of duty of "sand, crude or unmanufactured." In forwarding the appraiser's report you state that his advisory return would be followed by your office in the liquidation of entries.

The department in its decision of December 16, above referred to, expressed the opinion that as Belgian sand was commercially known as sand it was entitled to free entry as such under paragraph 1675 of the tariff act. Recently, however, certain domestic interests have requested a reconsideration of the department's ruling, contending that this so-called Belgian sand was properly dutiable at the rate of $4 per ton under the provision in paragraph 207 of the tariff act for crude silica, and that only sand of the character used for concrete work, plaster, walls, sanding tracks and similar uses is free of duty under the provision in paragraph 1675 for sand.

The provision for silica, crude, in paragraph 207 is new legislation, it not having been provided for in any previous tariff acts, and in the department's letter of December 16 it expressed the opinion that either paragraph 207 or paragraph 1675 standing alone would be applicable to the tariff classification of Belgian sand, and the department's ruling that this Belgian sand was free of duty was predicated upon the conclusion reached that it was commercially so known.

It would appear, however, upon further consideration of this matter that silica in fine grains is known as sand and that the term sand as commonly used is in fact substantially silica but not of the purity of the article used for certain purposes. It would seem necessary, therefore, to determine the kind of sand entitled to be free of duty under that term as used in paragraph 1675 and the sand which is properly dutiable as silica under paragraph 207, thus giving effect to both provisions.

Grades Are Distinguished

The department is in receipt of a letter from the Director of the Geological Survey, Department of the Interior, in which he states that low grades of sand for concrete work and similar uses are not dependent in any way on its chemical composition, although a certain range in size of grain and freedom from certain clay and other minerals is desired, but that high grade sands, especially those for glass manufacture and fluxing, must consist as nearly as possible of pure silica, and he concludes his letter with the statement that any material "pure enough to be sold as silica" or "glass sand" to the glass manufacturer or as silica flux to the metallurgist is, in his opinion, silica as distinguished from the sand used for structural purposes. The opinion of the Director of the Geological Survey is in accord with a letter received from the Director of Commerce, Bureau of Standards, Dept. of Commerce, and he concludes his letter with the statement that only that form of silica or sand should be admitted duty free as is suitable for and used chiefly for the making of concrete, mortar and other structural work.

In view of the foregoing the department has reached the conclusion that this so-called Belgian sand and other sand of a quality which has given to it the term glass sand is properly dutiable as silica, crude, under paragraph 207 as well as other sand containing silica in excess of 99%, if otherwise of the character ordinarily used in making glass and as a flux by metallurgists.

You are accordingly directed to assess duty upon Belgian sand and other similar sand at the rate of $4 per ton as crude silica under paragraph 207 of the tariff act. As this rate is higher than the practice now in effect in the classification of this material, these instructions should not be made effective until after 30 days after this letter is published in the weekly *Treasury Decisions*.

Canadian Crushed Gypsum Taken Off Free List

INSTRUCTIONS directing collectors of customs to begin assessment of duty upon imports of gypsum, crushed after being quarried, have been issued by the Bureau of Customs, according to an announcement June 13 by the Comissioner of Customs, E. W. Camp. It has been the practice to admit such gypsum free because of the claim that crushed gypsum was not comparable under the tariff act of 1922 to the material classified as ground gypsum.

Mr. Camp, in a letter addressed to the collector of customs at New York, and circularized to all collectors, explained that the classification should be under paragraph 205 of the act rather than under the duty free sections.

Following is the full text of the letter:

Sir: Reference is made to your letter of March 2, 1928, and previous correspondence relative to the tariff classification of crushed gypsum.

A firm of attorneys representing producers of gypsum in this country has protested to the department against the admission free of duty of crushed gypsum as crude gypsum under paragraph 1643, the attorneys claiming that crushed gypsum is properly dutiable as ground gypsum under paragraph 205 of the tariff act of 1922, or, alternatively, under paragraph 214 of the said act as an earthy or mineral substance, wholly or partly manufactured. In your letter of December 7 last, you enclosed a report from the appraiser at your port who stated that "all of the merchandise imported through the port of New York as crude gypsum is, in fact, crude, with natural quarry run pieces varying in size from very large to very small pieces" and that it is being returned free of duty under paragraph 1643, and the appraiser in his report expressed the opinion that gypsum crushed to 2-in. sizes is not ground gypsum within the meaning of that term as used in paragraph 205. As approximately 85% of the gypsum imported into this country which is classified as crude gypsum has its origin in Canada, the department requested the supervising agent at Montreal to have an investigation made and a report forwarded to the department as to the methods used in

the preparation of gypsum shipped to the United States from Canada.

Former Process Described

It appears from the supervising agent's report that formerly gypsum rock was broken into pieces of a size that could be lifted and loaded by a man (termed "man-size"), but the investigation developed that the rock from several quarries is now hauled to a crushing plant where it is dumped first into a "jaw-crusher" which breaks the gypsum into fragments still of a considerable size; and that it then goes by conveyor to a gyratory crusher which further reduces it to a maximum size of approximately 4½ in. One plant uses a jaw-crusher and then rolls the resulting fragments between rollers which further reduces them in size so that they are not over 3 in. in thickness but are occasionally a foot or more wide. The crushed gypsum is then carried up an incline on an endless belt carrier to the storage buildings and thence by another system of belts to the loading pier and then loaded on to the boat.

The supervising agent's report on the methods of handling this gypsum which is now being classified as crude gypsum agrees with those outlined in the publication of 1926 "Report on the Mines," Department of Publis Works and Mines, Halifax, N. S. This publication gives the various methods at the different quarries, and in describing that of the Newark Plaster Co., Ltd., whose product is shipped to Newark, N. J., states that before shipment the gypsum is all passed through the crusher set at 2½-in. opening and is then elevated and screened, the sizes ¼ in. and under being discarded and the oversize conveyed to storage bins and shipped in the crude form. The methods described in the third paragraph of this letter is the one used by the Canadian Gypsum Co., and other quarries are using substantially the same method of handling this gypsum.

No Clear Cut Definition

Paragraph 205 provides that ground or calcined gypsum shall be subject to duty at the rate of $1.40 per ton, while paragraph 1643 provides that crude gypsum shall be admitted free of duty, but there does not appear to be any clear-cut definition of the term "ground" so that it may be differentiated from "crushed," and the distinction would seem to be one of degree and that the term "ground" is used to describe something which has been reduced to smaller sizes than would be indicated by the use of the word "crushed." After a very careful consideration of this question and as the department is of the opinion that the provision for gypsum, crude, is intended to cover the article as it is taken from the quarry and not when it has been subjected to any further process, it is of the opinion that gypsum which had been crushed is properly dutiable as ground gypsum within the meaning of the tariff act, and I will state for your information in this connection that this conclusion is in harmony with an Order in Council of the Governor General of Canada, dated March 16, 1909, that broken gypsum rock, not ground, such as would pass through a ½-in. screen, was properly dutiable under Item 294 of the Canadian Customs Tariff as gypsum, ground, not calcined. This Order in Council was based upon an appeal from the decision of the Canadian Board of Customs dated January 12, 1909, which ruled that broken gypsum rock, not ground, was free of duty as gypsum, crude, under Item 292 of the said act.

For the reasons stated, you are directed to assess with duty as ground gypsum under paragraph 205, gypsum which has been crushed after having been taken from the quarry. However, as it is now the practice to admit this gypsum free of duty as crude gypsum, you should continue to pass it free of duty if entered for consumption or withdrawn from warehouse for consumption within 30 days after the date this letter is published in the weekly "Treasury Decisions."—*U. S. Daily.*

A public hearing on the subject has been set by the Treasury Department at Washington, D. C., on July 20, 1928.

Canadian Gypsum Industry Seeks Relief

THE SITUATION precipitated in the Nova Scotia gypsum industry by the classification by the United States customs of machine cracked gypsum rock as manufactured gypsum, bringing it under the tariff on the manufactured article of $1.40 per ton, was taken up again by the Nova Scotia Mining Society in annual session at Halifax, June 22, and a resolution passed asking the Provincial government to enlist the assistance of the Dominion government in having the classification altered.

Hon. Gordon S. Harrington, Provincial Minster of Mines, told the society that he had already wired the Dominion Minister of Trade and Commerce and had been advised that the subject matter of his communication had been passed to the Canadian minister at Washington to be taken up with the United States government.—*Wall Street News* (New York City).

Mexico to Have a Road Congress

THE AMERICAN ROAD BUILDERS' ASSOCIATION has accepted an invitation of the Mexican Federal Highway Commission and Government to participate in the Second National Highway Congress and Exposition to be held in Mexico City on October 3-4-5-6.

The invitation to the association comes from Mexico after that country has completed its third year of federal road construction and on the eve of a large highway construction program that will be participated in by all the Mexican states and cities as well as the federal government.

Invitations have also been sent to South and Central American countries to take part in this congress, and it is expected that delegations will be present from all Pan-American countries.

The object of the American Road Builders' Association in accepting the Mexican invitation is scientific and educational. The Association will exhibit the latest methods of highway engineering, showing the plans, maps, details and specifications used in the United States. In addition to this, the most recently developed economic construction methods will be shown by movies and photograps. The most up-to-date road building equipment and materials will be exhibited and arrangements have been made for demonstrations of road building machinery.

In accepting the Mexican invitation to take part in the Second National Highway Congress and Exposition, the Road Builders' Association will act through its Pan-American division, which was recently organized, and will make available to the road builders of Mexico and other Pan-American countries the latest and most economic practices in road building as now being used in the United States.

Special freight rates have been obtained for shipping road building machinery to Mexico, and reduced passenger fares will be in force. Several special trains to Mexico City will be run for the benefit of those wishing to visit the country at that time.

Over-Capacity Competition

(Extracts from an editorial in *Iron Age*)

IN almost every old industry in the United States there is an excess of producing capacity and also an excess of personnel. The desire to use as much as is possible of both develops keen competition and contraction, even extinguishment, of margin and profit. The economic theory is that this condition should reduce prices to the level of the marginal producer and should lead to the survival of the fittest only. The difference between theory and practice pertains to what is the cost of production and the margin of profit.

This is the most difficult determination in the case of production out of natural resources, especially the minerals, that are wasting assets.

Once an enterprise has been capitalized it must generally be kept going, and the law of the survival of the fittest may be very slow in its operation. The economic corrective is delayed until such time as there is no inducement to adventurers to invest in the class of enterprise that has become unprofitable. Adversity thus operates rather through the check to new capitalization than through curtailment of immediate production.

Los Angeles Gravel Firms in New Merger

THE Consumers Rock and Gravel Co. and California Materials, Inc., Los Angeles, Calif., have consolidated under the name of the Consumers Rock and Gravel Co., Inc. The combined companies supply about 30% of the rock, sand and gravel in this territory, operating nine crushing plants.

New Donnelly Gravel Plant at Newtown, Ohio

A TRACT OF LAND in Newtown, Ohio, comprising 349 acres, has been purchased by the Cincinnati Sand and Gravel Co. of Cincinnati, it was announced recently. The amount involved in the deal was said to be approximately $750,000, and a gravel plant will be located on the site by the recently incorporated sand and gravel company. The gravel pit will be operated within 30 days, it was said.

The deal includes the ground from Broadwell road, at Ancor, Ohio, south to and including the Sam and George Edwards tract of 286 acres and between the Norfolk and Western railroad and the Little Miami river. The cost of the plant is included in the estimate of $750,000.

Officers of the Cincinnati Sand and Gravel Co. are Harry Donnelly, president and general manager; William Reehl, vice-president; H. R. Birchall, treasurer, and Frank Kunkel, secretary.—*Cincinnati* (Ohio) *Post.*

Kansas City Can't Go Into Sand Business

THE Kansas supreme court has denied a rehearing in the suit brought to restrain the Kaw Valley drainage board of Kansas City, Kan., from engaging in the sand selling business.

Notice of the denial was received recently by Arthur J. Mellott, Wyandotte county attorney, who brought the suit against the drainage board in the name of the state. The supreme court recently decided the drainage board could not engage in a private business.

The drainage board had contended taking the sand from the river was coincident with the work of cleaning the channel and the sale of the sand was a profit to the district. —*Kansas City* (Mo.) *Star.*

Indianapolis Gravel Company Sues City to Live

SUIT seeking to enjoin the city of Indianapolis from enforcing an ordinance providing that commercial enterprises cannot be maintained within 500 ft. of a park, parkway or boulevard was filed by attorneys for the State Sand and Gravel Co. of Indianapolis in federal court Tuesday.

According to the complaint, the gravel company owns 28.46 acres of sand and gravel land north of the city which, it was asserted, is worth approximately $25,000. The plaintiff concern asserted that it has notice from the board of park commissioners that its property is within the restricted area and that, as it is designated as a commercial enterprise, it must cease working the ground.

The suit, which was in equity, asked that the federal court relieve the plaintiff from such confiscation of property rights, which, it was alleged, constitute a violation of the 14th amendment of the constitution.—*Indianapolis* (Ind.) *News.*

Michigan State Cement Plant Deficit Continues

"WHETHER the state cement plant at Chelsea, Mich., should be continued in operation at a loss at the present time as one of the state's prison's industries, or be closed down, but kept in operating condition as a guard against high cement prices, is a question which the state administrative board will be called upon to consider at the next meeting of the state administrative board," says a Lansing (Mich.) dispatch to the *Flint* (Mich.) *Journal,* which continues:

"With the building season in the state nearing a peak, prices of cement produced from privately owned mills is at the lowest point in many years, and is so low in fact that it is being sold at a figure below that which the state can manufacture it in its own mill. Governor Fred W. Green is seeking figures on the actual cost.

"State Treasurer Frank D. McKay recently raised the question as to the advisability of continuing the plant in operation with the present low market price of cement.

" 'I am not in favor of disposing of the plant, although at the close of business Tuesday it was $757,050 in the red,' said Mr. McKay. 'However, with shipments going from the plant daily, the deficit is also growing. If this cement price war is going to continue, then I believe that if it is a fact that the privately-owned mills are selling cement cheaper than we can manufacture it, then it might possibly be wise to close down the mill, keep it in good condition and be prepared to resume operations should prices go up. The deficit in the plant is in reality nearer $1,000,000 than $757,000, because we have never charged any depreciation against the cost. I propose to take up the matter with the board.'

"Governor Green was emphatic in the statement that the plant is not for sale.

" 'I have been accused ever since I have been in office of trying to turn this plant over to the cement interests,' said the governor. 'In my campaign and since I have never advocated the sale of the plant. I did say, and I say now, that there is question as to the legality of the state in purchasing the plant without the consent of the legislature, and if the plant is to be sold, it is a question for the legislature and not the governor and the administrative board to decide. The plant has been a losing proposition from the start, but it is entirely possible that the loss could be written off because of the saving the state has made in cement through reduction of prices by the privately-owned mills. Even though the plant might be shut down, I believe it good assurance against high cement prices, providing of course that it is kept in good operating condition. I am looking up cost figures and have no idea what action we will take.'

"The cement plant was purchased by Governor Alex J. Groesbeck for the state back in 1921 when the state got into trouble with the cement manufacturers over prices as well as delivery dates. It has been operated ever since, and the deficit has gradually grown.

"If the plant is kept, the next legislature will be asked to set up a revolving fund to provide for its operation. This was never done, the operating costs being paid from the highway and other state funds.

"It is pointed out that a revolving fund should be provided if the plant is kept. To operate a cement plant efficiently, cement men say it should be operated 24 hours a day during every day of the year. The state has large storage capacity at the plant and the cement turned out during the winter months is put away for summer use. As the highway building program lasts about six months, the state has faced the necessity of financing operations for six months on money borrowed from the state treasury.

"Because of the fact that the cement plant is again looming as a political issue, Governor Green is again going to make his position clear, so all political aspects may be removed and the entire question placed squarely before the next legislature."

New Railroad to Bring Shale to Standard Portland Mill

THE Fairport, Painesville and Eastern R. R. is building a new railway in northeastern Ohio.

The F., P. & E. was given a certificate of convenience and necessity by the Interstate Commerce Commission to build its extension from Painesville to a point on the Grand river south of Madison, in order to establish connections with the Nickle Plate at Perry and reach the large shale beds on the Grand river. The road handles considerable shuttle freight, having connections with the New York Central at Painesville and the Baltimore and Ohio at Fairport.

Although the extension is now completed only to Perry, it will be rushed ahead to the Grand river as soon as possible, C. J. Baumann, vice-president, said recently. The Standard Portland Cement Co., one of the road's largest shippers at Fairport, needs the shale for its cement manufacturing.—*Cleveland* (Ohio) *Plain Dealer.*

Oregon Portland Cement Co. Enlarging Plant

PLANS which have been in preparation for some time are about completed and the Oregon Portland Cement Co. will begin installation of a second unit to their cement plant at Lime, Ore.

The present capacity of the plant, which is 1200 bbl. a day, will be doubled. The finishing mill for cement grinding and two new packing machines will be the first of the new machinery to be installed.

When this plant was constructed four years ago the rock crushing plant, tramway and storage bins were built of a sufficiently large capacity to care for the second unit which will now be installed.

The company has a large stock of finished cement and clinker on hand; at present 160,000 bbl., and in preparation for the heavier demand which will be occasioned by the eastern Oregon irrigation work early next year, this stock will be increased by at least another hundred thousand barrels before March, 1929.—*Boise* (Idaho) *Stateman.*

Progress on New Marquette Cement Mill at Oglesby, Ill.

WORK on the new dustless cement manufacturing plant, which is being erected immediately south of the present mill of the Marquette Cement Manufacturing Co. in Oglesby, Ill., is making rapid progress. It was predicted recently that the new mill will be in operation within the next six or eight months.

The latest approved methods of cement mill designing are being used in the erection of the new Marquette plant and it will be when completed one of the most modern and efficient plants in the cement industry. It will have an annual production of more than 2,000,000 bbl., which will make the total production of the Marquette company more than 6,000,000 bbl. of cement annually.

To care for the increased production a modern cement storage capable of handling an additional million barrels is being erected.

In going forward with this enormous expansion program the Marquette Cement Manufacturing Co. officials had one thought uppermost in their minds, the elimination of dust. The problem of dust elimination has for years engaged the serious attention of cement engineers and it is only quite recently that continued studies and experiments have definitely shown a way. The dust-collecting systems that are to be installed in both the new and present plants will involve an expenditure of over $400,000.

The elimination of the dust is to be effected by the erection of gigantic stacks over 350 ft. high. Both these installations will also be completed within the next six or eight months.

"With the dust-collecting systems installed and the stacks erected, the residents of the city of Oglesby and surrounding territory can feel assured that there will be no gas or dust emanating from the plants of the Marquette Cement Manufacturing Co." officials of the company said recently.—*LaSalle* (Ill.) *Post.*

Rockdale Lime Company, Virginia, Sold

S. B. MILEY, Toms Brook, Va., R. S. Wright and Omar P. Stickley of Strasburg, Va., have purchased the property of the Rockdale Lime Co., Toms Brook. This property consists of the lime plant, quarries, including certain mineral rights on adjoining land, garage, stable, office building, cooper shop, five dwellings and several building lots.

The plant, which was owned by the John C. Pafton estate, has not been in operation for some time. The quarry was operated for over a year by the state highway department in manufacturing crushed stone, but the crushing plant was moved away last year. Included in the sale was also a large tract of timber land in Posey Hollow.

The plant will undergo some needed repairs, and will likely be put in operation in the near future. Mr. Stickley will have charge of it as manager. The new owners are successful business men, and it is safe to predict that their new venture will be a success, as have their interest in various other enterprises.—*Strasburg* (Va.) *News.*

West Coast Lime Plant Under New Ownership

PURCHASE of the Union Lime Co. plant at Williams, Ore., by the Standard Lime and Plaster Co. of Portland, Ore., was announced recently by D. N. Littler, president of the Portland concern. Mr. Littler stated that improvements at the limestone quarry will be started at once, with new kilns to be installed with a capacity of 50 tons of lime daily. A new crushing and screening plant is to be erected with a capacity of 50 tons of chicken grit daily.

Contracts already have been let for the entire production for the first year of operation, Mr. Littler declared. One hundred men will be employed at the start and more are to be put on as needed.

The Willamette valley needs millions of tons of limestone yearly for agricultural purposes, Mr. Littler asserted.

Josephine county limestone deposits show the highest test of any of the holdings of the Standard Lime and Plaster Co., according to Mr. Littler. Mr. Littler was accompanied here by Harry Dayton, of Portland, engineer, who is inspecting the property and surveying for roads. The plant will start operations in a short time, the new owners declare.—*Grants Pass* (Ore.) *Courier.*

Florida Phosphate Sets New Record for May Shipments

ANOTHER four-year record in phosphate shipment was set up last month. A total of 136,113 tons was shipped from the elevators of the Atlantic Coast Line and Seaboard in Tampa, Fla., during May.

In making this record the lines shipped 6625 more tons than in May, 1927; 12,357 more than in May, 1926, and 11,161 more than in May, 1925.

Thirty-six boats were required to handle the shipments, which went to Norway, Spain, Germany, Italy, Japan, Holland, Great Britain, France, Sweden and several ports in the United States.—*Muberry* (Fla.) *Press.*

F. A. Jones, a Consulting Engineer

F. A. JONES, well known in rock products industries as a former manager of operations of the Kelley Island Lime and Transport Co., and former manager of the Columbia cement division of the Pittsburgh Plate Glass Co., has joined a partnership with W. H. Hartman, under the firm name of Jones and Hartman, Inc., Engineers, 504 Citizens Bank Bldg., Canton, Ohio. The new firm will specialize in pulverized fuel preparation and application for all purposes, and in reports on, plans and estimates for cement, lime and gypsum plants.

F. A. Jones

Safety Meeting at Washington

Four Cement Mills of Chesapeake Region Hold First Conference for Accident Prevention

OPERATING DEPARTMENTS of the Lehigh Portland Cement Co.'s mills at Fordwick, Va., and Union Bridge, Md., the North American Cement Corp. at Hagerstown, Md., and the Virginia Portland Cement Corp. at Norfolk joined in the first regional safety meeting held by the mills of Maryland and Virginia at Washington, D.C. on June 15.

The meeting, which was held in the assembly hall of the Cosmos Club, was presided over by G. F. La Forge, superintendent of the Lehigh mill at Union Bridge. The Union Bridge mill has long been a leader in the safety work of the industry, Mr. La Forge being a confirmed safety enthusiast of many years' experience. Theodore Marvin, managing editor of *The Explosives Engineer* of Wilmington, Del., gave a paper on "Sincerity in Accident Prevention" and presented a motion picture showing safe practices in the handling and use of explosives.

George W. Brownell, North American Portland Cement Co.

J. J. Forbes, in charge of the first aid and rescue work of the United States Bureau of Mines, discussed the teaching and administration of first-aid and the value of first-aid training to all men of the mill as effective safety propaganda.

Mr. Forbes also conducted a demonstration of resuscitation, bandaging and other first-aid work, with the assistance of a trained member of his staff, and made available to those present copies of the Bureau of Mines handbook on the subject.

George W. Brownell, safety director of the North American Cement Corp., Hagerstown, Md., described its safety organization work and told how his company had twice succeeded in winning the "Sentinels of Safety" trophy in the contest conducted each year by the U. S. Bureau of Mines. Ethelbert Stewart, veteran commissioner of the U. S. Bureau of Labor Statistics, presented a paper reaffirming the value of statistics to safety work and pleading for a more extended use in the future.

Safety and Statistics

Mr. Stewart said in part: "You are doing things—progressing with your accident prevention work—largely by reason of the statistics along these lines which you have gathered so plentifully and published so freely in your reports. When you scare away the bogey man by forgetting your fear of statistics, you are always on the way to great accomplishment. You are printing more detail of accidents and accident statistics than any association not only in the United States but in the world.

"I think it is generally admitted that the cement industry is a hazardous industry, and you have succeeded in reducing accidents in a hazardous industry to a point very much below those which occur in many really non-hazardous industries. It is just barely possible that it would not cost any more to take your industry out of the hazardous group than it does to keep down the accidents while remaining a hazardous industry.

"Your figures show that practically 30% of your accidents occur among employes who have been on your payroll less than six months and 42% among employes who have been employed one year or less. While your figures do not show your labor turnover, the percentages I have just given certainly should convince you that one of the most hazardous things in your industry is your labor turnover.

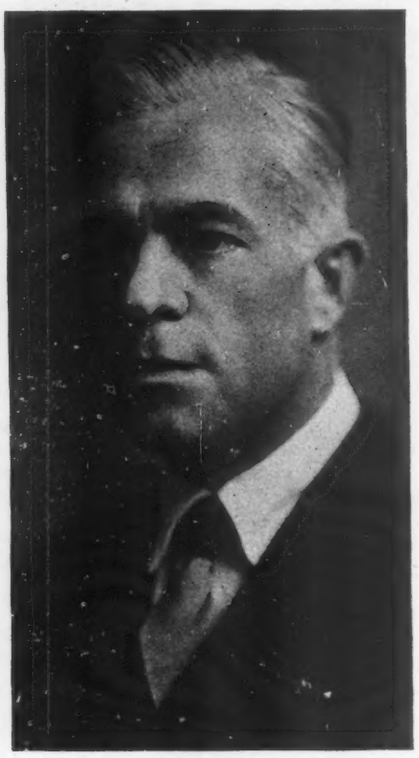
"I am always glad to meet with the safety groups of the cement industry. No organization of any such proportion has to my knowledge accomplished the results that the cement industry has achieved. I am particularly pleased with your accident statistical work. You are growing less and less afraid of statistics and constantly making them serve you with increased benefit to industry."

G. F. La Forge, who president at the Washington meeting

The round table discussion of current mill safety problems, led by Superintendent George Martinez of the Norfolk mill, was participated in by practically all of the 35 delegates present. Statistical information developed during the meeting shows that the mills represented have a very enviable record during the past two years, but as none of them have yet succeeded in winning the Portland Cement Association trophy, the attention of the meeting was directed toward methods for attaining perfect safety records. During the entire year 1927 these mills had only nine lost time and one fatal accident.

Dwight Morgan, vice president of the Virginia Portland Cement Co., Norfolk, Va., acted as toastmaster at the dinner served in the Cosmos Club garden, and Daniel Harrington, chief engineer of the Bureau of Mines, was the dinner speaker. Mr. Har-

rington spoke interestingly of the various fields of work undertaken by his bureau and of the future plans for co-operating more effectively with the cement plant quarries. A complete plan of action is being worked out by Mr. Harrington along lines which will interest every quarry in the cement industry. Mr. Morgan thanked Mr. Harrington for the splendid help given by the Bureau of Mines during the past year, particularly in first-aid training and in assistance at the various regional safety meetings.



Dwight Morgan, vice president of the Virignia Portland

Registration

The registration at the meeting was as follows:

Lehigh Portland Cement Co., Fordwick, Va.
W. G. Augur, quarry superintendent.
W. T. Law, master mechanic.

Lehigh Portland Cement Co., Union Bridge, Md.
James E. Coleman, carpenter.
C. Earle Eichelberger, mechanical engineer.
J. U. Engler, machinist.
Frank Fritz, pit man.
Howard Gray, chief engineer.
Guy E. Green, plumber.
Harvey O. Haines, yard.
Ray Haines, crusher foreman.
G. S. LaForge, superintendent.
Lester K. Nusbaum, mix chemist.
Marlin H. Routson, repairman.
Chas. E. Selby, storekeeper.
Wm. L. Selby, steam shovel engineer.
Marshall Sprague, repairman.
M. B. Wilson, employment.

North American Cement Corp., Hagerstown, Md.
O. Brandenberg, construction foreman.
Geo. W. Brownell, safety director.
Perry Cloud, safety inspector.
A. R. Couchman, safety director.
L. B. Frankenberry, electrical foreman.
T. E. Riggs, general foreman.
Chas. Sowers, repairman.
C. E. Taylor, quarry superintendent.

Virginia Portland Cement Co.
A. L. Crowe, general mill foreman.
Otto H. Enax, chief electrician.
P. J. Glennon, chief clerk.
G. F. Martinez, superintendent.
Dwight Morgan, vice-president.
J. B. Reed, foreman, clay fields.
R. R. Riley, sales.
C. J. Rowley, sales.
J. J. White, foreman.
L. F. White, master mechanic.
H. A. Williams, chief chemist.
E. N. Woodward, packhouse foreman.

Miscellaneous
A. J. R. Curtis, Portland Cement Association.
J. J. Forbes, supervising engineer, U. S. Bureau of Mines.
Theodore Marvin, managing editor, *Explosives Engineer.*
C. W. Owings, associated engineer, U. S. Bureau of Mines.
James J. O'Neill, *Explosives Engineer.*
Geo. R. Ricker, Portland Cement Association.
Ethelbert Stewart, commissioner of labor statistics.

Four Mills Dedicate Cement Association Trophies

For Safe Operation in 1927

JUNE, the month of brides and roses, witnessed ceremonies marking the dedication and unveiling of the Portland Cement Association Safety Trophy for 1927 in four of the ten winning mills. The dates and locations of the celebrations were as follows:

June 2—Kansas Portland Cement Co., Bonner Springs, Kan.

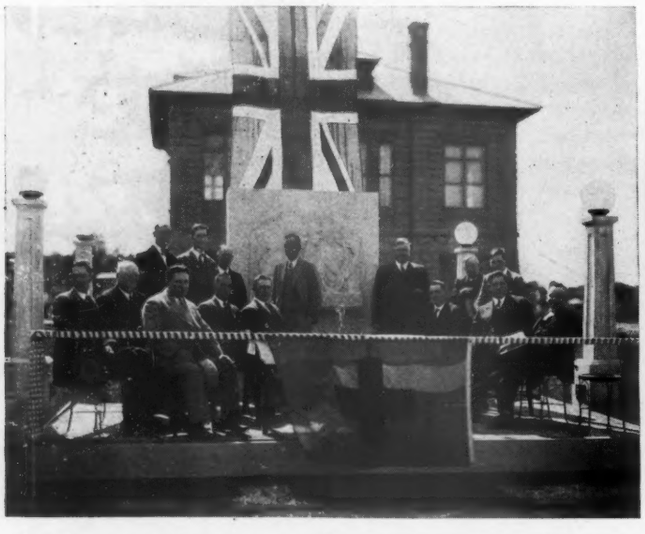
June 15—Canada Cement Co., Hull, Que.

June 16—Canada Cement Co., Belleville, Ohio.

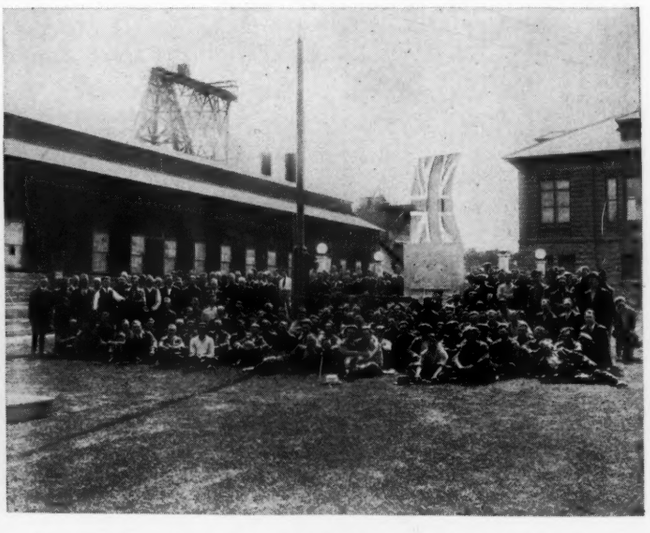
June 27—Lehigh Portland Cement Co., Iola, Kan.

June 30—Lehigh Portland Cement Co., New Castle, Penn.

These ceremonies all provided red letter days in the communities where held. Public officials, local civic and industrial leaders and leaders in the cement industry from near and far, joined hands with plant workers, their families and citizens generally, in celebrating these unusual events. Seldom if ever has so much attention been paid to cement-mill organizations by the communities in which they are located, and it is unlikely if they ever received so many expressions of commendation. Appreciation of the winning local industries were heard on every side and expressions of goodwill appeared in the local press and in the utterances of community leaders and directors of state or provincial labor and insurance depart-



Speakers and other guests at the unveiling of the trophy at the Hull plant, Canada Cement Co.



The group gathered for the dedication of the safety trophy at the Hull plant

ments. The story of the unveiling ceremonies at the Bonner Springs (Kan.) mill appeared in ROCK PRODUCTS for June 23.

Hull Celebration Outstanding

Fitting tribute was paid to the splendid operating record of the Canada Cement

Elmer French

C. G. Carter

Co.'s mill at Hull, Que., on June 15. Hull is located across the river from Ottawa, the dominion capital, and a number of public officials and citizens of that city were in Hull for the occasion. There was also present a large delegation of company officials and many representatives of other industrial plants in the vicinity. Operations at the cement plant were temporarily suspended so that practically all employes could attend with their families.

Superintendent Elmer E. French of the Hull mill, who acted as master of ceremonies, introduced George E. Warren, assistant general manager of the Portland Cement Association, who formally turned over the trophy to the mill organization. In complimenting the employes on their showing, Mr. Warren pointed out that few industries could boast comparable records. "Your success in winning this trophy," declared Mr. Warren, "has resulted in a far-reaching influence on industry throughout the community and country. You have given a mighty example." Mr. Warren pulled aside the British flag with which the trophy was veiled, revealing it to a happy, cheering group.

J. D. Johnson, vice-president and general manager of the Canada Cement Co., accepted the trophy on behalf of the company and plant. Mr. Johnson expressed his keen pleasure at the record established by the Canada company in winning four of the association trophies in three years

A. C. Tagge, president of the Canada Cement Co.

and of the great progress made by the Hull mill. "These are precedents that will be beneficial to all," he said.

Other speakers were: L. M. McDonald, superintendent of the Canada Cement Co.'s mill at Port Colborne, Ont.; A. G. Beck, superintendent of the company's mill at Montreal; Aime Guertin, member of the Quebec Legislative Assembly; Alderman C. Boland of Hull, representing Mayor Theodore Lambert, who was unable to be present. Other company officials of the Canada Cement Co. present were: W. G. H. Cam, power and safety engineer, Montreal; H. S. Van Scoyoc, publicity manager, Montreal; H. A. Bergeron, representing the sales department and J. W. Gaulin, representing the company's mill at Belleville, Ont. Preceding the

J. D. Johnson

J. H. Legate

ceremony, the company was host at a luncheon at the Windsor Hotel, Hull.

Belleville on Following Day

Several of the guests at the Hull celebration went immediately by train to Belleville, Ont., where similar ceremonies were held in connection with the dedication and unveiling of the Belleville mill's trophy on the following day. The thriving village of Point Anne, just east of Belleville, where the plant is located, was in gala attire for the event.

Distinguished visitors present for the unveiling ceremonies were as follows: V. A. Sinclair, chairman of the Workman's Compensation Board of Ontario; Repre-

W. G. H. Cam

sentatives E. Tummon of Tweed and Joseph Hill of Shannonville, members of the Legislative Assembly of Ontario; M. P. Duff, mayor of Belleville; J. O. Herity, secretary of the Chamber of Commerce of Belleville; Thomas B. Angrove, of Kingston, representing J. T. Burt, chief factory inspector of the province; A. C. Tagge, president of the Canada Cement Co., Montreal; G. E. Warren, assistant general manager of the Portland Cement Association, Chicago; H. S. Van Scoyoc, publicity manager, Canada Cement Co., Mont-

Dedication of the safety trophy at the Belleville plant, Canada Cement Co.

real; V. C. Moynes, sales manager, Canada Cement Co., Toronto; W. G. H. Cam, power and safety engineer, Montreal; A. G. Beck, E. W. Bailey and Elmer E. French, superintendents of the Montreal, Lakefield and Hull plants of the Canada company, respectively. The above were among the guests of the Canada Cement Co. at luncheon at the Quinte Hotel.

Preceding the ceremonies at the plant a procession was formed in town, consisting of school children, workmen of the plant and other marching behind the Argyll Light Infantry Band, carrying banners and flags. Arrangements for the procession were in charge of P. J. Hart and Colonel E. Keller acted as marshal. About 325 workmen and 200 school children were in line. Each mill department carried its own banners or placards of which the following are examples:

"Quarry department, 602,000 tons quarried without an accident."

"Kiln department, 10,800,000 bbl. cement produced without an accident."

"Carpenters, 692 days, no accidents."

"Raw mill, 2,465,000 tons of material produced, no accidents."

The parade proceeded to the mill park on the lake front where the ceremonies were held. Superintendent J. H. Legate expressed the thanks of the company and men to the visitors for their attendance and called upon all of the visitors for short speeches. R. B. Morley, chairman of the Accident Prevention Association of Canada, stated that there were 72,000 accident cases dealt with by the industrial boards in 1926 and only 24,000 cases in 1927. V. A. Sinclair, chairman of the Workman's Compensation Board, pointed out that the 72,000 accidents referred to above had cost $6,000,000. He was particularly enthusiastic over the presence of a large group of school children as indica-

C. A. Swiggett

Baxter McClain

tion of accident prevention education being given to the boys and girls.

Assistant General Manager Warren, of the Portland Cement Association, dedicated and unveiled the monument. He stated that up to 1927 only four plants had been able to win the association trophy for operating an entire year without an accident, and that the Belleville plant had been one of the ten to make a perfect record in 1927. The accomplishment he said was a matter of whole-hearted team work, discipline and self-control. "You have accomplished something that less than half a dozen others in the world have done," Mr. Warren said.

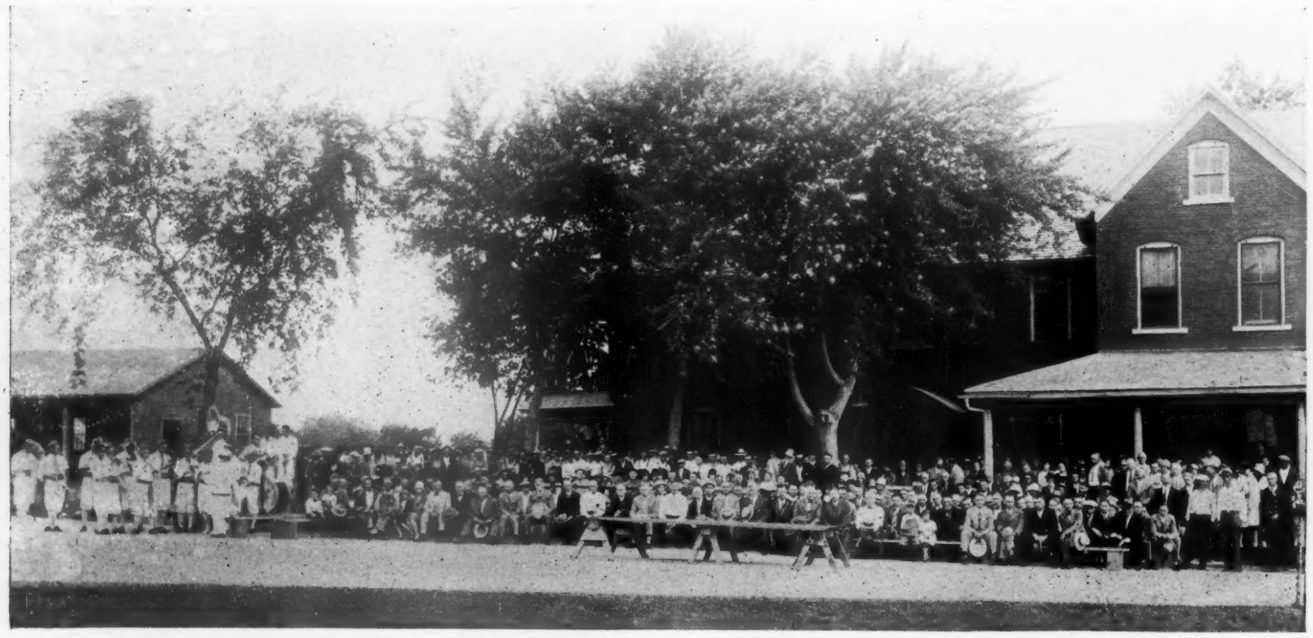
The cheering continued wildly as A. C. Tagge, president of the Canada Cement Co., stepped to the platform to accept the trophy on behalf of his men. Mr. Tagge was chairman of the Committee on Accident Prevention of the Portland Cement Association for a number of years and is considered a leading exponent of mill safety in the cement industry. He extended congratulations to every employe of the plant and declared the winning of the trophy to be the result of perfect work. He expressed the hope that the record would be repeated and stated that he felt the greatest satisfaction at what the men had done. "You have done it once, therefore, this great achievement can be performed again, adding another inscription to the trophy indicating that the Belleville mill has gone two years without an accident."

Rain No Hindrance at Iola

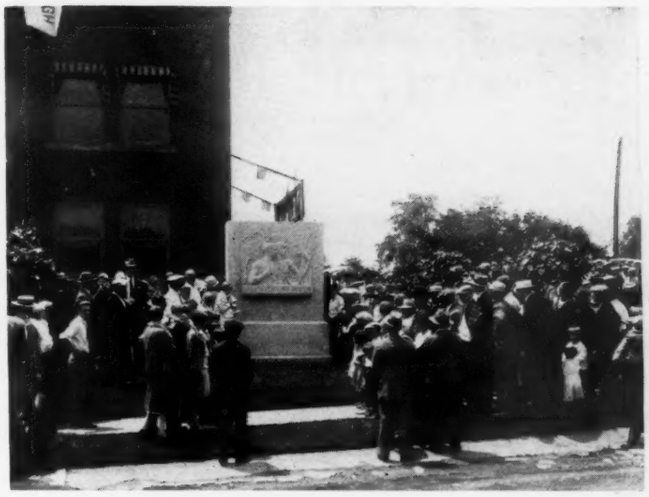
The Iola (Kan.) plant of the Lehigh Portland Cement Co. unveiled its association safety trophy on Wednesday afternoon, June 27, notwithstanding recurring showers throughout the day. At noon, the Iola Chamber of Commerce held a luncheon given over to the story of the Iola plant's record and to the accident prevention work of the cement mills.

A 2 o'clock in the afternoon operations ceased in the mill and a procession arrived from town consisting of the Iola DeMolay band, followed by fifty automobiles. Superintendent C. A. Swiggett mounted the platform constructed on the park outside the mill office, where an assemblage of about 800 people were grouped, and introduced Dr. H. G. Mathis, pastor of the First Presbyterian Church of Iola, who made the invocation.

Mr. Swiggett then introduced A. J. R. Curtis, assistant to general manager of the Portland Cement Association of Chicago, who formally turned the association



The assemblage that turned out for the dedication of the safety trophy at the Iola plant of Lehigh Portland



The safety trophy of the New Castle plant of the Lehigh Portland Cement Co.

W. H. Kleckner, speaking at the trophy dedication at New Castle

trophy over to the plant by authority of the board of directors and on behalf of the members of the Portland Cement Association throughout America. Mr. Curtis extended the congratulations of the entire industry to Col. E. M. Young, president of the Lehigh Portland Cement Co.; to Major H. A. Reninger, chief of accident prevention; C. A. Swiggett, local superintendent, and to every employee of the plant and his family.

The trophy was then unveiled by Messrs. R. E. McDonald, chief engineer of the plant, and R. D. Moritz, master mechanic, who were the two delegates chosen by the men of the plant to receive the formal award of the trophy at the recent meeting of the Portland Cement Association in New York.

The trophy was accepted on behalf of the mill organization by Mr. Swiggett. Baxter McClain, of Kansas City, for 18 years connected with the Iola mill as attorney and in other relationships, was the principal speaker. Mr. McClain traced the uphill struggle of the Iola mill since it was put in operation over a quarter of a century ago and related anecdotes drawn from his early experiences with the cement pioneers of Kansas. Major H. A. Reninger spoke later, stressing the importance placed on the welfare of the workmen by the Lehigh company.

The Iola mill was immaculate. The many visitors found a surprising degree of mechanical perfection as well as cleanliness which revised old timers' ideas of cement-mill operation. Picnic refreshments were served and most of the visitors remained at the mill throughout the afternoon.

New Castle's Red Letter Day

Dedication of the Portland Cement Association Safety Trophy for 1927 at New Castle mill No. 3 of the Lehigh Portland Cement Co. on Saturday, June 30, proved a most important event.

The area surrounding the plant office buildings was decorated with flags and bunting and several hundred seats provided. An hour before the time announced for the ceremonies the crowd began to assemble. When the plant whistle was blown at 2 o'clock, practically every family represented in the plant, as well as members of the state assembly, the mayor, district attorney, judges and many prominent townspeople and representatives of other cement mills were present.

Col. E. M. Young, president of the Lehigh Portland

The program was as follows:

Music—"Star Spangled Banner" by band
—Raising of Stars and Stripes on plant flag pole.
Invocation—Rev. F. E. Stough, St. John's Lutheran Church.
Song—Verse of "America."
Introduction of A. J. R. Curtis, assistant to the general manager, Portland Cement Association, Chicago, by W. H. Kleckner, superintendent of New Castle mill.
Presentation of trophy by A. J. R. Curtis, representing the Portland Cement Association.
Unveiling of trophy—by Dorothy Kleckner and Viola Sera.
Introduction of Wesley Davy, chief engineer of New Castle plant, chairman of the day.
Address by Judge Chambers of New Castle.
Address by Hon. Bart Richards, state assemblyman.
Address by Major Henry A. Reninger, Lehigh Portland Cement Co., Allentown, Penn.

After completion of the program, Chairman Davy announced a baseball game in the ball park adjacent to the office building, where after a half hour spent in partaking of the refreshments, game was called between a girls' ball team representing the nearby plant of the Buckeye Manufacturing Co., and the "Red Hot Clinkers" of the Lehigh mill.

Among the prominent visitors who spent the afternoon at the New Castle mill were: Mayor William Gillespie, Senator Barton Richards, District Attorney Elder Bryan, F. F. Morehead, Attorney J. Norman Martin, Judge K. L. Hildebrand, Fred Rentz, owner of the *New Castle News*, O. J. Binford, general manager, and A. C. Hiscox, superintendent of the West Penn Cement Co., and representatives of various railroads.

Foreign Abstracts and Patent Review

Physico-Chemical Phenomena in Building Materials. Prof. J. W. McBain conducted several experiments at Bristol University on moisture sorbtion* and dye sorption, by methods normally used in the investigation of colloidal materials in other fields. The specimens supplied were samples of building materials, some of which showed moisture expansion under engineering test and some which did not. A summary of typical results is given in the accompanying table.

TABLE 3.—WATER VAPOR AND DYE (METHYLENE BLUE) SORPTIONS OF CERTAIN BUILDING MATERIALS

Material	Relative Humidity	Water vapor sorbed by 1 gm. Milligrams	Absorption of Dye
Brick	0.70	0.0	None.
(Red Wire-cut)	1.00	0.0	
Brick	0.92	0.0	
(Red Rubber)	0.98	0.0	
Brick	0.46	1.0	
(Stock)	0.95	1.6	
Brick	0.85	0.0	
(Blue Stafford)	1.00	0.5	
Quartz Powder	0.20	0.0	
	0.94	0.0	
Marble	0.70	0.0	
(Stonecombe Stone)	0.88	0.0	
Limestone	0.70	0.0	
(Buxton)	0.90	0.0	
Dolomitic Limestone	0.52	2.1	Very slight.
(Gold Coast)	0.89	4.1	
Limestone	0.21	2.7	Slight.
(Portland)	0.81	3.0	
Limestone	0.19	1.5	
(Bath)	0.91	3.2	
Granite	0.88	0.0	Considerable.
(Dartmoor)	1.00	1.5	
Limestone	0.17	4.0	Great. Color almost completely abstracted from supernatant solution.
(Kentish Rag)	0.72	7.5	
	0.91	11.0	
Sand-lime	0.16	3.0	
Brick	0.81	5.2	
	0.96	8.0	
Chalk	0.20	3.4	
(Norfolk)	0.61	5.7	
Millstone Grit	0.19	2.1	Completely absorbed from supernatant solution.
(Darley Dale)	0.48	3.4	
	0.72	5.2	
	0.99	13.0	
Sandstone	0.19	3.6	
(Yorkshire)	0.48	5.0	
	0.70	7.5	
	0.99	10.3	
Gatton Stone	0.19	20.0	
	0.48	28.0	
	0.72	41.2	
	0.91	66.1	

In the above experiments the order of increasing dye sorption is the same as that of increasing moisture sorption except in the case of granite whose dye sorption is comparatively high. This explained by the presence of mica which, as is well known, sorbs dyes. Prof. McBain summarizes his paper as follows:

"1. A systematic study has been made of the sorption by typical building materials at various degrees of humidity both of water vapor and of other liquids.

*By the term "sorbed" is meant water which is held more firmly than free water, e.g., a saturated brick, but not so firmly as chemically combined water, e.g., gypsum.

"2. Certain building stones are shown to be exempt from disintegrating action due to this particular cause, viz., fluctuating humidity.

"3. It is shown that the intergrain cement of such stones as sandstone is colloidal, whether siliceous or amorphous zeolitic, and an explanation is given of the moisture changes and swelling observed, upon the basis of the micellar hypothesis leading to a suggested definition of a stone preservative against this particular type of disintegration.

"4. Parallel results are obtained by staining with dyes.

"5. After being heated to 850° sandstone loses its power of sorbing water vapor or dyes.

"6. The heat sorption equals heat of liquefaction in the case of vapor of octane, but is greater in the case of polar liquids."

—*Stone Trades Journal, May* 1, 1928.

Lead-Glycerin Cement. O. Kallanner and T. Pospisil obtained by mixing fine litharge with glycerin, a rapid setting mixture of considerable strength. It should be recalled that litharge is soluble in glycerin, forming lead glycerate which is precipitated from over-saturated solutions. According to Morawsky the formular for this cement is $C_3H_6O_2$ PbO.

Experiments were conducted relative to the setting process, strength, chemical resistance, bond with metal and the effect of various chemicals, added to the cement. It was found that the more lead oxide added and the thinner the solution, the more rapid the set. The greatest strength is obtained from a mixture comprising 10 parts PbO to 1 part concentrated glycerin, however this produces a very tenacious material which is of no value for most purposes. A dilute glycerin solution (sp. gr. 1.074) and a low PbO content results in a cement of low strength owing to the low solubility of PbO and the resulting insufficient formation of lead-glycerate. If a concentrated glycerin solution (sp. gr. 1.262) and a low PbO content is used, poor strength again results, this time being due to insufficient PbO present to form a saturated solution of lead-glycerate. The most satisfactory fluid mixture consists of 4-5 parts PbO to 1 part glycerin solution having a sp. gr. of 1.21-1.26. The pacture modulus of this mixture is practically double the tensile strength.

The setting process is complete in approximately two days. The strength after 7 to 28 days shows only a slight variation from that obtained after two days. Water, strong organic acids, and sodium hydroxide negatively influence the combining power. Sulfuric acid causes the formation of lead sulphate, sodium hydroxide forms sodium plumbate and nitric acid forms soluble lead nitrate. In these experiments the surface was attacked but the core, presumably consisting of lead-glycerate, remained uneffected. The bond of lead-glycerine cement to metal is poor. The addition of small amounts of nitric acid retard the setting time, while NH_3 and sodium hydroxide tend to accelerate it. The latter also decreases the tensile strength and causes efflorescence. In contrast the tensile strength is increased by the addition of NH_3 and soda, as well as weak bases. *Transactions of the Ceramic Society of England, Vol.* 24, *Part* II., (1927) 91-92.

Improvements in Processes and Apparatus for Grinding Cement and Like Materials. In grinding cement and kindred raw materials, experience has shown that if the temperature in the grinding machine exceeds 100 deg. C., the ground material appears to clog, which, as determined by experiments, reduces the efficiency of the machine as much as 33%.

The invention consists in adding a small amount of water (1-3%) to the material to be ground, which when exposed to the heat of grinding binds so much heat by its subsequent evaporation that the material is cooled to below the critical temperature of the grinding process; that is, the temperature at which the cement shows a tendency to clog.

The grinding apparatus for carrying out the process consists of an arrangement wherein the water supply pipe is introduced into the grinding machine through one of its ends, preferably through the discharge end. An atomizing device may be attached to the end of the water conduit, to rapidly distribute moisture over the interior of the desired part of the mill.—*Carl Pontoppidan (Denmark), British Patent No.* 283,091.

Plastic Compositions Containing Oxychlorides. (W. A. Oakley, British Patent No. 281,757)—A hot solution of magnesium, ferric, or like chloride is added to a mixture of magnesia and an earthy filler such as carbonate, siliceous or aluminous clay, calcareous earth, kaolin, sand, calcium sulphate, etc. When the filler consists of calcareous earth or alkaline clay a metallic sulphate such as alum may be mixed with either the liquid or solid ingredients. In this case a dry product which sets upon the admixture of water may be obtained by adding the hot chloride solution to the filler and the sulphate, allowing the mixture to set, grinding it and then adding the magnesia. When the other fillers are employed a small quantity of an alkaline silicate may be added to the chloride solution. The product is useful as an artificial stone or a plaster.—*Stone Trades Journal, May* 1, 1928.

Theory of Lime Burning. The process of lime burning is summarized by the equation:

$$CaCO_3 = CaO + CO_2$$

This reaction is dependent on the temperature and pressure and takes place from left to right, although it may assume the reverse course. Thus at certain temperature and pressure conditions an equilibrium is reached, which relation was studied by LeChatelier and Riesenfeld.

The theoretical temperature required in a lime kiln is about 900 deg. C. Temperatures higher than the latter indicate that carbon dioxide is driven off slowly. Different limestones require different temperatures, which thus vary between 1000 and 1400 deg. C. Hard crystalline limestones call for high temperatures. The size of the charge is also of importance, as is the steam produced from the moisture contained in the rock.

However, a purely chemical standpoint does not suffice to explain the processes taking place in a lime kiln. Physical chemistry treats the individual crystal of calcium carbonate as a regular atomic structure of Ca-atoms and CO_3-atom groups. This regularity is upset in burning and a disperse system is produced. Thus the calcium oxide produced in burning may be regarded as having the properties of a solid gel.

Urbach made a determination of the minimum quantity of carbon required for the burning of 100 kg. calcium carbonate. His computations led to the value of 9 kg. If the gases formed during combustion were made to give up all of their heat for heating the limestone, this quantity would be reduced to 5.43 kg. Block established the value of 7.8 kg. per 100 kg. limestone for conditions assuming an ideal kiln. In practice these values would naturally become modified.—*Tonindustrie-Zeitung* (1928), 348.

Resistance of Materials to Frost Action. Resistance to frost action is one of the most important properties required from structural materials in northern climates. The usual method of testing this property consists in exposing the water saturated specimen to a temperature of —15 deg. C., then allowing it to thaw out, whereupon the procedure is repeated until some defects are noted or until 24 repetitions prove the resistance of the specimen by its unharmed condition.

This simple method has certain disadvantages emphasized by Hirschwald in Bautechnische Gesteinsuntersuchungen, Report of the Mineralogical-Geological Institute, Kgl. Tchn. Hochschule, Berlin, 1910, Vol. 1, p. 20. His argument is that water expands by 1/10 of its volume in changing to ice. When the pores of a rock are uniformly filled with water to the extent of 9/10, freezing results in a complete filling of the pores with no particular pressure, so that the rock remains unchanged by frost action. Only when saturation is carried beyond 9/10, the ice finds insufficient room in expanding and produces cracks.

On the basis of this Hirschwald developed a theory, that completely water soaked rocks yield to frost action, no matter what their strength, while incompletely water-soaked rocks resist this action even when their strength is low.

As pointed out above, a rock, saturated to 9/10, was designated by Hirschwald as "incompletely" saturated. For various reasons, which need not be dealt with here, the present investigator set his limit value at 0.8. The accuracy of this value was confirmed by hundreds of specimens. He also published a method of determining the "saturation coefficient," which consists in determining absorption by immersing the specimen for 1 to 2 hours (W_a) and that of a completely water-soaked specimen saturated under pressure after complete evacuation (W_c). The ratio W_a/W_c gives that part of the pore volume which is filled through capillary action. Materials, used for structural purposes, have a "saturation coefficient" of 0.8.

Although in past years Gary has argued against this method (*Zeitsch. Verein Deutscher Ing.*, 1912, p. 727), it is entitled to a place in testing structural materials, for it is evident that the commonly accepted test is too strict for materials which are never completely soaked by precipitation in nature, so that many a suitable material is eliminated as non-resistant to freezing.—*Tonindustrie-Zeitung* (1928), 658.

Heat Insulating Material. DRP 447,725, July 14, 1925, Kl. 80b. Dr. Hans Scheidemandel (München). To obtain good heat insulation, materials of great fineness and high absorption may be used to advantage, as upon driving off of the water they yield highly porous products of low specific gravity. Aside from the minerals occurring in nature, use may be made of products of industry, mostly residues and wastes, which may be successfully transformed into insulating materials of high value. Almost without exception, however, such products require preliminary treatment, such as washing, grinding, sieving, etc. The patented process recovers the dust from flue gases, etc., by means of electricity. This dust requires no additional handling and has a finely subdivided structure and high absorption.—*Tonindustrie-Zeitung* (1928), 658.

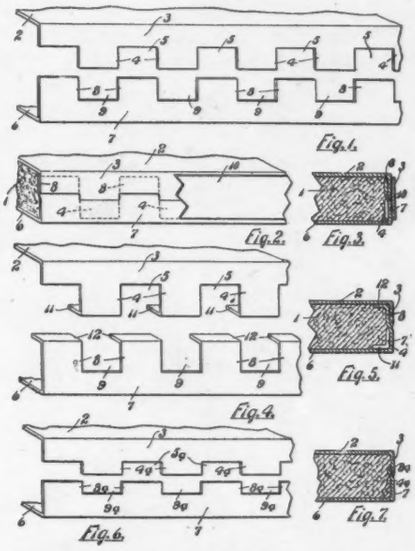
Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Method of Heat Treatment of Alumina and Other Materials. Alumina ore is broken into suitable fragments and brought into contact with an explosive mixture of carbon bearing gas and air, the gas mixture having an insufficient oxygen content to permit its complete combustion. This causes a deposition of carbon in the hot bed of alumina, which, when sufficient air is introduced, oxidizes the alumina and converts it into corundum.—*Thomas S. Curtis, assignor, Pacific-Southwest Trust and Savings Bank, U. S. Patent No.* 1,662,739.

Paving Material and Process of Making the Same. The process consists of manufacturing a paving material by impregnating with bituminous matter a steam hardened mixture composed of gravel and a minor quantity of lime dust.—*Friedrich Iwanski, U. S. Patent No.* 1,661,832.

Plaster Board. A plaster board in which the paper sheathing covering the core is joined at the edges in the following manner: the paper at the edges of the board is provided with alternate and evenly spaced



Interlacing sheathing for plaster board

tongues and grooves, the tongues of one sheet being opposite and interlacing inwardly with the grooves of the other.—*Carl Absmeier, U. S. Patent No.* 1,657,333.

Tuyere. The invention consists of a water-cooled tuyere having its metal parts insulated with a refractory material. It is designed for use at high temperatures such as in blast furnace or lime kiln operation.—*A. J. Ebner, assignor to Freyn Engineering Co., U. S. Patent No.* 1,662,850.

Cementitious Material. A cement consisting of ground anhydrite mixed with approximately 1% each of ground sodium thiosulphate and ground zinc sulphate and 10% each of finely divided clay and plaster of paris. The mixture forms a plastic cement upon the addition of water.—*Harry E. Brookby and Carlisle K. Roos, assignors to United States Gypsum Co., U. S. Patent No.* 1,668,548.

Cementitious Composition. A cement having quick-setting properties and composed mainly of calcium aluminate, aluminum sulphate, calcium hydroxide and calcium carbonate.—*Jesse A. McCormick and Charles A. Cabell, assignors to National Lime Association, U. S. Patent No.* 1,656,984.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone flux Week ended June 2	Limestone flux Week ended June 9	Sand, stone and gravel Week ended June 2	Sand, stone and gravel Week ended June 9
Eastern	3,214	3,200	14,762	13,954
Allegheny	3,105	3,372	9,640	9,406
Pocahontas	517	626	933	791
Southern	543	522	12,148	10,108
Northwestern	1,226	1,675	9,687	9,112
Central Western	341	367	12,653	13,120
Southwestern	486	448	6,722	5,989
Total	9,432	10,210	66,545	62,480

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1927 AND 1928

District	Limestone Flux Period to Date June 11 1927	Limestone Flux Period to Date June 9 1928	Sand, Gravel and Stone Period to Date June 11 1927	Sand, Gravel and Stone Period to Date June 9 1928
Eastern	66,879	55,892	146,904	142,203
Allegheny	78,273	69,805	132,144	114,866
Pocahontas	9,029	8,125	15,693	16,269
Southern	12,199	12,661	254,439	224,270
Northwestern	29,063	22,420	113,321	99,010
Central Western	11,101	9,146	175,172	185,403
Southwestern	6,959	9,434	112,406	120,449
Total	213,503	187,483	950,079	902,470

COMPARATIVE TOTAL LOADINGS, 1927 AND 1928

	1927	1928
Limestone flux	*213,503*	*187,483*
Sand, stone, gravel	*950,079*	*902,470*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning June 30:

SOUTHERN FREIGHT ASSOCIATION DOCKET

18738. To establish on **crushed stone**, carloads, McVittys, Ohio, to McCutchenville, Ohio, rate of 70c per net ton; proposed rate to apply via C. C. C. and St. L. Ry., Berwick, and the N. Y. C. line (Ohio Central). Present rate, 80c per net ton.

18739. To establish on **crushed stone and crushed stone screenings**, carloads, Bluffton, Ind., to Fremont, Ind., rate of 101c per net ton. Route—Via N. Y. C. & St. L. R. R., Ft. Wayne, Ind., and N. Y. C. Present rate, sixth class.

18740. To establish on **crushed stone**, carloads, Mitchell, Ind., to Bicknell, Ind., rate of 100c per net ton. Present rate, 112c per net ton.

18741. To establish on **crushed stone**, carloads, Maple Grove, Ohio, to Sullivan, Ohio, via P. R. R., Tiffin, Ohio, B. & O. R. R., rate of 90c per net ton. Present rate, 115c per net ton.

18742. To establish on **crushed stone**, carloads, Woodville, Ohio, to Easton, Ohio, rate of 105c per net ton. Present rate, 115c per net ton.

18743. To establish on **crushed stone**, carloads, Maple Grove, Ohio, to points in Ohio, rates per net ton as shown below:

Destination	Pres.	Prop.
Cadiz, Ohio	*$3.90	$1.45
East Rochester, Ohio	1.50	1.35
Kensington, Ohio	1.50	1.35

*Sixth class.

40631. **Crushed stone** from Whitestone, Ga., to Kansas City, Mo. It is proposed to publish a through rate of 530c per net ton on crushed stone, carloads, from Whitestone, Ga., to Kansas City, Mo., via East St. Louis, Ill., same as Memphis, Tenn., combination.

40640. **Molding sand** from Cincinnati, Ohio, Louisville, Ky., and Evansville, Ind., to Ball Ground and Canton, Ga. Rates on ordinary sand now apply. Proposed rate on sand, molding, carloads (See Note 3), from and to points mentioned, 248c per net ton, same as rate applicable to Marietta and Atlanta, Ga.

40643. **Sand, gravel, crushed stone**, etc., between stations on the N. C. & St. L. Ry., between Chattanooga, Tenn., and Stevenson, Ala., and stations on the A. G. S. R. R., C. B. & C. River Ry., C. N. O. & T. P. Ry., G. S. & F. Ry., N. O. & N. E. R. R., Northern Alabama Ry. and Southern Ry. It is proposed to amend the application of Scale 1, Section 2, of Agent Glenn's I. C. C. A655, by the addition of the following clause:

"Between stations on the A. G. S., C. B. & C. R., C. N. O. & T. P., G. S. & F., N. O. & N. E. and Southern Ry. (except Memphis Division west of Stevenson) and stations on the N. C. & St. L. Ry. between Chattanooga, Tenn., and Stevenson, Ala., i.e., Lookout, Tenn., to Bolivar, Ala., inclusive, Stevenson, Ala., rates will apply as maxima; between stations on the Northern Alabama or Southern Ry. (Memphis Division west of Stevenson, Ala.) and stations on the N. C. & St. L. Ry. between Stevenson, Ala., and Chattanooga, Tenn., i.e., Bolivar, Ala., to Lookout, Tenn., inclusive, Chattanooga, Tenn., rates will apply as maxima. Stevenson, Ala., or Chattanooga, Tenn., rates to apply as maxima only when the rates to or from these points are made by use of the Southern Ry. system's single line mileage."

40692. **Ground limestone**, from Cartersville, Ga., to Tuskegee, Ala., and B. & S. E. R. R. stations. Combination rates now apply. Proposed rates on: Ground or pulverized limestone or marble, carloads, minimum weight marked capacity of car, except when car is loaded to full visible capacity, actual weight will apply; from Cartersville, Ga.: To Tuskegee, Ala., 216c per net ton; to B. & S. E. R. R. stations, viz.: Cotton Valley, Wilda, Liverpool, Wheatley, Ala., 222c; Wares Mill, Calebee, Conifer, Tuckabatchie, Ala., 216c; Tahassee, Bowens, Asberry and Eclectic, Ala., 222c per net ton. Made on basis that has been used in establishing rates on this commodity to various points in Alabama, Georgia, Florida, Miss., North and South Carolina.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

14765. **Sea or shore sand**, carloads (See Note 3), from Boston, Mass., and Old Orchard, Me., to Maine Central R. R. stations as follows, in cents per 100 lb.:

To	From Boston, Mass.	From Old Orchard, Me.
Auburn, Me.	13½	10
Bangor, Me.	16½	13½
Bath, Me.	13½	10
Calais, Me.	19	17½
Gardiner, Me.	14½	11
Hallowell, Me.	14½	11
Lewiston, Me.	13½	10
Livermore Falls, Me.	15	11
Mechanic Falls, Me.	13½	10
Oakland, Me.	15½	11½
Old Town, Me.	16½	14½
Waterville, Me.	15½	11½

Reason—To place the rates to points on the Maine Central R. R. on the same basis as now published for other joint hauls within New England.

18700. To establish on **limestone dust**, carloads, minimum weight per Consolidated Freight Classification, Kenova, W. Va., to Ohio, rates as shown. Present rates, Cincinnati, $2.20; Columbus, $1.80; all others, sixth class.

Stone Dust from Kenova, W. Va., to Ohio points (per net ton)

To	Prop.	To	Prop.
Ironton	$0.80	Millersburg	$2.10
Portsmouth	.92	Orrville	2.15
Sardinia	1.20	Burbank	2.15
Hillsboro	1.40	Creston	2.15
Cincinnati	1.44	Sterling	2.15
Waverly	1.08	Rittman	2.15
Chillicothe	1.20	Ashland	2.10
Circleville	1.28	Mansfield	2.05
Columbus	1.36	Delaware	1.85
Lisman	1.04	Edison	1.95
Bloom Jct.	1.04	Galion	2.00
Jackson	1.22	Crestline	2.00
Hamden	1.26	West Loudenville	2.05
Wellston	1.26	Marion	1.95
Dundas	1.26	Bucyrus	2.26
Gallipolis	1.60	Upper Sandusky	2.20
Pomeroy	1.60	Marysville	1.85
Carbondale	1.90	Peoria	1.85
Grosvenor	1.80	Ridgeway	2.15
Athens	1.80	Kenton	2.20
Belpre	2.00	Dunkirk	2.25
Marietta	2.00	Bellefontaine	2.15
Lancaster	1.49	Slater	2.26
Logan	1.54	Lima	2.26
Nelsonville	1.90	Greenfield	1.44
New Lexington	1.85	Washington C. H.	1.49
Corning	2.00	Jeffersonville	1.70
Newark	1.85	South Charleston	1.80
Caldwell	2.30	Springfield	1.85
Zanesville	1.85	London	1.80
Trinway	1.95	St. Paris	2.04
Coshocton	2.05	Quincy	2.15
Cambridge	2.05	Milford Center	1.85
Lore City	2.10	Xenia	1.80
Bellaire	2.25	Dayton	1.85
New Comerstown	2.05	Troy	2.15
St. Clairsville	2.10	Sidney	2.26
Uhrichsville	2.10	Wapakoneta	2.26
Bowerston	2.15	Midland City	1.85
Adena	2.15	Blanchester	1.85
Steubenville	2.25	Loveland	1.85
Dover	2.10	Middletown	1.85
Valley Junction	2.15	Wilmington	1.85
Oneida	2.15	Hageman	1.85
East Liverpool	2.25	Lebanon	2.00
Yellow Creek	2.25	Middletown	1.85
Centerburg	1.85	Hamilton	1.85
Mt. Vernon	1.95	Carlisle	1.85
Justus	2.15	Savona	2.26
Navarre	2.15	Arcanum	2.20
Massillon	2.15	Greenville	2.31
Canton	2.15	Ansonia	2.31
Brinkhaven	2.05	Celina	2.31
Killbuck	2.05	Ohio City	2.37

18723. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel**, carloads, from Lake Ciecott, Ind., to Wabash Ry. stations in Indiana, rates as shown below, in cents per net ton:

To	Prop.	Pres.	To	Prop.	Pres.
Andrews	90	104	Menzie	80	92
Lagro	90	104	Peru	80	92
Wabash	85	92	New Waverly	80	92
Rich Valley	85	92	Danes	80	92

14862. **Stone, broken or crushed**; in bulk, in open cars, carloads (See Note 2), from Westfield, Mass., to Hazardville, Conn., $1 per net ton. (To expire January 1, 1929.) Reason—To meet competitive conditions.

14531. **Lime** and **limestone**, from points of origin on N. Y. N. H. & H. R. R. to points on the Niagara frontier as listed in N. Y. N. H. & H. R. R., I. C. C. F2672, via Penna. R. R. Proposed, to cancel the P. R. R. route in the tariff referred to, leaving only class rates as provided in N. Y. N. H. & H. R. R., I. C. C. F2426 to apply over that route in future from and to the points involved and on the commodities specified; for example, rate on lime, carloads, Lee, Mass., to Niagara, Falls,

N. Y., over P. R. R. will be 28½c cwt. Reason—To avoid complication that might arise at intermediate points.

18679. (A) **Building lime,** carloads, minimum weight 30,000 lb. (B) Agricultural, land, chemical, gas or glass lime, carloads, minimum weight 30,000 lb., also ground limestone, carloads, minimum weight 50,000 lb., from Ashcom, Penn.

Rates in Cents per 100 Lb.

To—	Proposed rate A	B
B. & E.—		
Love Point to Walsey, Md.	14	13
Queenstown, Md.	14	12½
Centreville, Md.	14	12½
Bloomingdale to Downes, Md.	14	12½
Tuckahoe and West Denton, Md.	14	13
B. C. & A.—		
Ocean City to Kitts Hill Md.	17½	16
Dirricksons to Berlin, Md.	14½	13
Harrisons to St. Martins, Md.	17	16
Whaleyville to Williards, Md.	17	16
Pittsville to Darbys, Md.	16	16
Mardela Springs, Md.	16	16
Vienna to Hurlock, Md.	14½	13
Ellwood to Tanyard Sdg., Md.	17½	16
Easton, Md.	14	13
Tred Avon to Claiborne, Md.	17½	16

Reason—To establish rate from Ashcom, Penn., which will be comparable with rates now in force from Bellefonte and Pleasant Gap, Penn.

18680. (A) **Building lime,** carloads, minimum weight 30,000 lb. (B) Agricultural, land, chemical, gas or glass lime, carloads, minimum weight 30,000 lb., also ground limestone, carloads, minimum weight 50,000 lb., from Ashcom, Pa., to Kane, Penn. (A) 14c, (B) 13c per 100 lb. Reason—Proposed rates are comparable with rates now in force from Shraders, Penn., to Sergeant and Johnsonburg, Penn.

18692. **Stone, crushed,** carloads (See Note 2), from Snow Flake, W. Va., to Martinsburg, W. Va., $2.30 per ton of 2000 lb. Reason—Proposed rate is comparable with rate now in force from Martinsburg, W. Va., to Richwood, W. Va.

TRUNK LINE ASSOCIATION DOCKET

19064. **Stone, crushed,** N. O. I. B. N. in Official Classification, carloads (See Note 2), from Northampton, Penn., to Taylor to Scranton, Penn., incl., $1.40 per ton of 2000 tons. Reason—Proposed rates are comparable with rates on like commodities from and to points in the same general territory.

19069. **Stone, crushed,** carloads (See Note 2), from Howellville, Penn. Rates in cents per 2000 lb.

To—	
Carpenter, Del.	115
Wooddale, Del.	115
Landenberg, Penn.	125
Kiamensi, Del.	115
Leslie, Md.	150

Reason—Proposed rates are comparable with rates now in force from Birdsboro, Penn.

19070. (A) **Sand** (other than blast, engine, foundry, glass, molding, quartz, silex or silica) and **gravel** (other than molding gravel), carloads; (B) **sand (blast, engine, foundry, glass, molding, quartz, silex or silica) and molding gravel,** carloads (See Note 2), from Cape May, N. J. Rates in cents per 2000 lb.

To—	(A)	(B)
Philadelphia, Penn., stations	150	165
Birmingham, N. J.	163	168

Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

19085. (A) **Limestone, crude or crushed fluxing,** carloads (See Note 2).

(1) Applies only on open top equipment, except during period of shortage, when shipper orders open top equipment and carrier, for its own convenience, furnishes box car, account of inability to supply open top equipment, the rates provided for open top equipment will apply.

(2) Applies only when shipped in box cars, except as shown above (reference being made to the open top equipment clause).

(B) **Ground limestone,** carloads, minimum weight 50,000 lb. From Bellefonte and Pleasant Gap, Penn., to East Kane, Penn., to LaMont, Penn. Proposed rates—(A) (1) †164c, (2) *10c; (B) *10c. †In cents per 2240 lb. *In cents per 100 lb. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

19088. **Sand** (other than blast, engine, foundry, glass, molding or silica) and **gravel,** carloads (See Note 2), from Otisville, N. Y.

To—	Prop. rate Net ton
Pond Eddy, Penn.	$ .85
Parkers Glen, Penn.	.85
Shohola, Penn.	.95
Lackawaxen, Penn.	.95
Mast Hope, Penn.	1.05
Narrowsburg, N. Y.	1.05
Skinners Falls, N. Y.	1.05
Cochecton, N. Y.	1.05
Callicoon, N. Y.	1.15
Hankins, N. Y.	1.15
Long Eddy, N. Y.	1.25
Lordville, N. Y.	1.25
Stockport, N. Y.	1.30
Hancock, N. Y.	1.30
Hales Eddy, N. Y.	1.30

Reason—Proposed rates are comparable with rates on like commodities from East Corning, N. Y., to points in the same general territory as destinations named above.

8617, Sup. 2. **Crude or crushed fluxing limestone,** carloads (See Note 2), from Union Bridge, Caveton, Security, Salisburg, Pinesburg and Charlton, Md., and Pinola, Penn., to Bayonne and Perth Amboy, N. J., $2.90 per ton of 2240 lb.

19093. **Sand** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2) from Morrisville and Tullytown, Penn., to Beach Haven, N. J., $1.50 per ton of 2000 lb. Reason—Proposed rates are favorable with rates on like commodities for like distances, services and conditions.

19099. **Sand, blast, engine, foundry, glass, molding, quartz, silex or silica,** carloads, 90% of marked capacity of car, from West Winfield, Penn., to Cresston, Penn., $1.98 per ton of 2000 lb.; Loretta Road, Penn., Patton, Bakerton, Spangler, Barnesboro and Hastings, Penn., $2.16 per ton of 2000 lb. Reason—Proposed rates are comparable with rates on like commodities from and to points in the same territory.

19100. **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2), from Honey Brook and Narvon, Penn., to Lancaster, Penn., 75c per ton of 2000 lb. Reason—Proposed rates are comparable with rates from Morrisville, Penn., to Westmoreland, Penn., and Flemington, N. J., and from Bacon Hill, Md., to Bald Friar, Md., and Benton, Penn., etc.

19106. **Stone, crushed, screenings, stone,** carloads, from Hyndman, Penn., to B. & O. R. R. stations in the state of Pennsylvania, Williams, Niverton, Jerome, Johnstown, Mt. Braddock, Leckrone, Crystal Ovens, Connellsville, Edna, Dommler, Braddock, Bruceton and various rates ranging from 60c to $1.20 per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in force on like commodities for like distances, services and conditions.

18957, Sup. 1. Amend rate proposal 18957 covering rates of **sand, gravel and crushed stone** from western Pennsylvania points to C. F. A. and Trunk Line territories by adding as points of origin Stone Hill and Friend, Penn., on the same basis as authorized from Connellsville, Penn., in accordance with mileage scale in I. C. C. Docket 15329 and P. S. C. Penn. Dockets C5855, C6961 and C7079.

18977. (A) **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads; (B) **sand, blast, engine, foundry, molding, glass, silica, quartz or silex,** carloads (See Note 3).

From: Group 1—Woodbury, Salem, Quinton, Bridgeton, Dorchester, Muskee Siding, Collingswood and Pomona, N. J.

Group 2—Absecon, Atlantic City, Belleplain, Ocean City, Stone Harbor, Wildwood Crest and Cape May, N. J.

To Media, Penn. From	Proposed Rate (A)	(B)
Group 1	150	160
Group 2	160	180

Reason—Proposed rates are comparable with rates now in force to Lafayette, Bristol, Chester, Pa., and Wilmington, Del.

18983. **Gravel and sand, N. O. I. B. N.** in open cars, except blast, engine, foundry, glass, molding, quartz, silex and silica, carloads (See Note 2), from Sherburne, N. Y., to New Hartford and Utica, N. Y., 75c per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in force from Sherburne, N. Y., to Binghamton, N. Y.

18985. **Limestone, ground or pulverized,** and **limestone dust,** carloads, minimum weight 50,000 lb., from Jamesville, N. Y., to all stations on the L. & H. R. Ry., $2.40 per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in force from Lime Crest, N. J., to Syracuse, Oswego and Utica, N. Y.

18987. **Sand** (other than blast, engine, foundry, glass, molding, quartz, silex or silica), carloads (See Note 2), from Steelton, Penn., to points on the Reading Co. and P. R. R., Philadelphia, Palmyra, Catasauqua, Gettysburg, Penn., Wilmington, Del., Swedeland, Columbia, Sunbury, York, Penn., and Baltimore, Md., rates ranging from 65c to $1.65 per ton of 2000 lb. Reason—Proposed rates are made with relation to rates from other shipping points to the same general territory, viz., Mt. Hope and Philadelphia, Penn.

18904. **Limestone, ground, precipitated or pulverized,** and **limestone dust,** carloads, minimum weight 50,000 lb., from Ogdensburg, N. J., to Andover, Beverly, Chelsea, Chicopee Falls, Lowell and Reading, Mass., 19½c per 100 lb.

18994. (A) **Sand and gravel** (other than blast, engine, glass, molding or foundry, quartz, silex and silica), carloads, (B) **sand, blast, engine, glass, molding or foundry, quartz, silex and silica,** carloads (See Note 2), from Hancock, Round Top and Tonoloway, Md., to Port Jervis, N. Y., (A) $3.10, and (B) $3.40 per ton of 2000 lb. Reason—Proposed rates compare favorably with rates from Hagerstown, Md., and from Williamsport, Md., to Appleton and Lyndonville, N. Y.

19024. **Trap rock, mine rock, broken stone, crushed stone and stone screenings** in bulk, carloads (See Note 2), from Jamesville and Rock Cut, N. Y., to Conklin, N. Y., 91c per ton of 2000 lb. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

19036. **Gravel and sand, N. O. I. B. N.,** in Official Classification, except blast, engine, foundry, glass, molding, quartz, silex and silica, carloads (See Note 2), from Kenvil, Succasunna and Wharton, N. J., to East Stroudsburg or Stroudsburg, Penn., 85c per ton of 2000 lb. Reason—Proposed rate compares favorably with rates from Netcong, N. J.

19038. **Agricultural, land, chemical, gas or glass lime,** carloads, minimum weight 30,000 lb., also **ground limestone,** carloads, minimum weight 50,000 lb., from Ashcom, Penn., to Wheatland, N. Y., 16c per 100 lb. Reason—Proposed rates are comparable with rates now in force from Bellefonte, York and Bainbridge, Penn.

19042. **Sand,** carloads (See Note 2), from Masonville to South Pemberton, N. J., inclusive, to New Lisbon, N. J., 70c per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in force on like commodities between points in the same general territory.

19054. **Gravel,** carloads, (See Note 2), from Staffordville, N. J., to Seaside Park, N. J., 81c per ton of 2000 lb. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

19055. **Crushed stone,** carloads (See Note 2), from Auburn, N. Y., to Ludlowville, N. Y., to Willets, N. Y., inclusive, 83c per ton of 2000 lb. Reason—Proposed rate is comparable with rates on like commodities from Auburn to Varna, Dryden, Sterling, N. Y., and from Oaks Corners to Auburn and Levanna, N. Y.

WESTERN TRUNK LINE DOCKET

2814B. **Stone, crushed,** carloads **(See Note 2),** but not less than 40,000 lb., from Pinehill, Mich., to Winona, Minn. Present rate, $4.20 per net ton; proposed, $2.70 per net ton.

1564M—Rate: **Stone, crushed,** carloads, usual minimum weight, from Dell Rapids, S. D., to Le Mars, Iowa. Present—$1.36 per ton (Dell Rapids-Remsen rate applied intermediate). Proposed—$1.20 per net ton.

6519, Sup. 1—Rates: **Stone, crushed,** carloads, from Mississippi river crossings to Sioux City, Iowa. Present—No specific commodity rate. Proposed—Local, 13½c. Proportional (originating Southeastern and Carolina territory), 12½c.

6088, redocketed—Rate: **Rock, gannister,** carloads, from Ablemans, Devils Lake and Rattlesnake, Wis., to Gary, Ind., Joliet, Ill., East Chicago, Ind., and South Chicago, Ill., via E. J. & E. Ry. Present—Gary, $1.82; Joliet, $1.46; South Chicago, $1.82; East Chicago, $1.46. Proposed—$1.50 per net ton.

ILLINOIS FREIGHT ASSOCIATION DOCKET

2913D. **Sand and gravel,** carloads (See Note 3), but not less than 40,000 lb., from Muscatine, Iowa. Rates in cents per net ton to (representative) Illinois points.

	Present	Proposed
Atlas	Class E	111
Dwight	Class E	136
Marblehead	Class E	136
Rockport	Class E	149
Lyndon	Class E	98
Earlville	Class E	123
East Rockford	Class E	196

3253E—**Sand and gravel,** in carloads, from Monronts and Conkeys Pit, Ill., to Emington, Saunemin and Wing, Ill. Present—113 cents per net ton. Proposed—101 cents per net ton.

4268B. **Sand (lake, river and bank,** other than sand loam), carloads.

From Gary, Ind., Calumet, Ind.

To—	Present	Proposed
Elgin, Ill.	Classn. basis	125
Elmhurst, Ill.	Classn. basis	93
Westchester, Ill.	Classn. basis	93
Wheaton, Ill.	Classn. basis	92

4526. To advance the rates on **sand and gravel,** carloads, from Joliet, Ill., to all points within the Gary, Ind., corporate limits to a basis not less than that in effect to Gary, Ind., proper. The rates from Joliet, Ill., to be restricted to apply only for account of the Michigan Central R. R. and E. J. & E. Ry.

4527. **Unwashed gravel,** carloads (See Note 3), but not less than 40,000 lb., from Spring Valley, Ill., to West Brooklyn, Ill. Present, 80c per net ton; proposed, 70c per net ton.

4527, Sub. 1. **Unwashed gravel,** carloads (See Note 3), but not less than 40,000 lb., from Spring Valley, Ill. Rates per net ton. Present—To Meriden, Ill., 70c; Earlville, Ill., 75c. Proposed—To Meriden, Ill., 65c; Earlville, Ill., 70c.

4530. **Stone, crushed,** in open cars, carloads, from Thornton, Ill., to stations on the N. Y. C. & St. L. R. R. in Illinois.

To (representative points)	Rates per net ton. Present	Proposed
Humrick, Ill.	*	126
Trilla, Ill.	*	126
Fancher, Ill.	*	135
Dressor, Ill.	*	140
Donnellson, Ill.	*	145
Edwardsville, Ill.	*	150

*Combination of locals.

4532. **Sand, core** (See Note 1), from Van's Siding, Ill., to West Kankakee, Ill. Rates per net ton. Present, 76c; proposed, 38c.

4534. **Crushed stone**, carloads, from Joliet, Ill.

To—	Rates per net ton Present	Proposed
Bradt, Ill.	88	80
Rockford, Ill.	126	90

CENTRAL FREIGHT ASSOCIATION DOCKET

18760. To establish basis of 65% of sixth class on **crushed or ground limestone**, carloads, Quincy, Ill., to C. F. A. territory east of the Indiana-Illinois state line. Present basis—80% of sixth class.

18761. To establish on **crushed stone and crushed stone screenings**, carloads, Marblehead, Ohio, to Gobles, Mich., rate of 155c per net ton. Route—Lakeside and Marblehead, N. Y. C.-M. C. Present rate, sixth class.

18763. To establish on **crushed stone**, carloads, from McVittys, Ohio, to Canton, Ohio (W. & L. E. Ry.), rates of 90c per net ton. Present rate, 17c.

18765. To amend C. F. A. Tariff 197 series, naming rates on **gravel, slag, cinders**, etc., from Chicago, Joliet and other stations to stations on the Toledo and Western Ry., to provide for the same rates to Pioneer, Ohio, as published in aforesaid tariff to Alvordton, Ohio (T. & W. Ry. delivery). Present—No through commodity rates.

18773. To establish on **raw or crude dolomite and fluxing stone**, carloads, minimum weight marked capacity of car, except when car is loaded to full cubical or visible capacity, actual weight will apply. (When loaded in open top cars, except during period of general car shortage, when open-top equipment is not available and closed equipment is furnished at carrier's option, the basis for rates provided herein will apply.) Centerville, Ohio, to Hamilton, Ohio, via Penna. R. R., rate of 76c per gross ton. Present rate, 12c.

18785. To establish on **sand (foundry, burnt or refuse)**, carloads, Detroit, Mich., to Lansing, Mich., rate of 135c per net ton. Present rate, 310c per net ton.

18786. To establish on **sand and gravel**, carloads, Milford, Ind., to New Buffalo, Mich. (M. C. R. R.), rate of 102c per net ton. Present rate, 13½c (sixth class).

18806. To establish on **stone, crushed** (in bulk), **screenings, limestone, unburned agricultural** (in bulk, in open-top cars only), carloads, from Silica, Ohio, to stations on the N. Y. C., E. J. & E., P. M., M. C. and Ann Arbor R. R. rates as shown below. Present and proposed rates as shown in Exhibit "A" attached.

EXHIBIT A

Station—	—Per net ton.— Pres.	Prop.
N. Y. C. R. R.		
Butler, Ind.	$1.05	$ .93
Waterloo, Ind.	1.05	.93
Corunna, Ind.	1.01	.93
Kendallville, Ind.	1.05	.93
Brimfield, Ind.	....	1.06
Wawaka, Ind.	....	1.06
Durham, Ind.	....	1.89
Ottawa Lake, Mich.	.75	.74
Riga, Mich.	.76	.78
Blissfield, Mich.	.76	.82
Grosvenor, Mich.	.76	.82
Palmyra, Mich.	.76	.82
Lenawee Junction, Mich.	.76	.82
Adrian, Mich.	.76	.87
Cadmus, Mich.	.85	.87
Clayton, Mich.	.88	.92
Hudson, Mich.	.88	.92
Pittsford, Mich.	.88	.97
Osseo, Mich.	.88	.97
Hillsdale, Mich.	.88	1.02
Jonesville, Mich.	.88	1.02
Allen, Mich.	1.01	1.02
Quincy, Mich.	1.01	1.07
Coldwater, Mich.	1.01	1.07
Batavia, Mich.	1.01	1.12
Bronson, Mich.	1.01	1.15
Burr Oak, Mich.	1.15	1.15
Sturgis, Mich.	1.13	1.17
Klinger Lake, Mich.	1.26	1.17
White Pigeon, Mich.	1.26	1.17
Vistula, Ind.	1.26	1.25
Bristol Ind.	1.26	1.25
Fayette Branch.		
Ogden, Mich.	.76	.82
Jasper, Mich.	.76	.87
Weston, Mich.	.76	.87
Morenci, Mich.	.88	.92
Fayette, Ohio	.88	.92
Goshen and Michigan.		
Middlebury, Ind.	1.26	1.30
Findlay, Mich.	1.38	1.25
Toledo-Detroit.		
Alexis, Ohio	.60	.60
Vienna, Mich.	.75	.74
Monroe, Mich.	.76	.82
Monroe Branch.		
Strasburg, Mich.	.76	.82
Ida, Mich.	.76	.87
Petersburg, Mich.	.88	.87
Deerfield, Mich.	.88	.87
Dundee-Moscow.		
Dundee, Mich.	.88	.97
Rea, Mich.	.88	.92
Britton, Mich.	.88	.92
Ridgeway, Mich.	.88	.87
Tipton, Mich.	....	.92
Onsted, Mich.	.88	.92
Addison Junction, Mich.	.88	.97
Addison, Mich.	.88	.97
Jerome, Mich.	.88	1.02
Moscow, Mich.	1.01	1.02
Jackson Branch.		
Tecumseh, Mich.	.76	.87
Clinton, Mich.	.88	.92
Manchester, Mich.	.88	.92
Norvell, Mich.	.88	.97
Napoleon, Mich.	.88	.97
Jackson, Mich.	1.05	1.02
Ypsilanti Branch.		
Ypsilanti, Mich.	.88	1.02
Pittsfield, Mich.	.88	1.02
Saline, Mich.	.88	1.02
Bridgewater, Mich.	.88	.97
Brooklyn, Mich.	.88	.97
Cement City, Mich.	.88	1.02
Somerset, Mich.	.88	1.02
Somerset Center, Mich.	.88	1.02
North Adams, Mich.	.88	1.02
Jackson-Ft. Wayne Branch.		
Horton, Mich.	1.01	1.07
Hanover, Mich.	1.01	1.07
Mosherville, Mich.	1.01	1.02
Bankers, Mich.	.88	1.02
Reading, Mich.	.88	1.02
Montgomery, Mich.	1.01	1.07
Ray, Ind.	1.01	1.07
Fremont, Ind.	1.01	1.06
Summit, Ind.	1.05	.93
Auburn, Ind.	1.05	.93
Auburn Junction, Ind.	1.05	.93
Lansing Branch.		
Litchfield, Mich.	....	1.07
Homer, Mich.	1.38	1.07
Albion, Mich.	1.38	1.07
Devereaux, Mich.	1.38	1.15
Springport, Mich.	1.38	1.15
Eaton Rapids, Mich.	1.38	1.15
Dimondale, Mich.	1.38	1.25
Lansing, Mich.	1.38	1.25
Grand Rapids Branch.		
Constantine, Mich.	1.38	1.25
Moore Park, Mich.	1.38	1.35
Flowerfield, Mich.	1.38	1.35
Portage, Mich.	....	1.35
Plainfield, Mich.	....	1.45
Otsego, Mich.	1.84	1.45
Hopkins, Mich.	1.84	1.55
Hilliards, Mich.	1.84	1.55
Dorr, Mich.	1.84	1.55
Byron Center, Mich.	1.84	1.55
	R.R.	
Ann Arbor, Mich.	AA .88	.92
Azalia, Mich.	AA .88	.92
Canton, Mich.	PM 1.12	.97
Dundee, Mich.	AA .88	.82
Erie, Mich.	PM .76	.78
Federman, Mich.	AA .76	.78
LaSalle, Mich.	MC .76	.78
Lulu, Mich.	AA .76	.74
Milan, Mich.	AA .88	.82
Monroe, Mich.	MC .76	.82
Monroe, Mich.	PM .76	.82
Pittsfield, Mich.	AA .88	.87
Plymouth, Mich.	PM 1.12	.97
Samaria, Mich.	AA .76	.78
Steiner, Mich.	PM .85	.82
Temperance, Mich.	AA .76	.70
Urania, Mich.	AA .88	.87
Vienna, Mich.	MC .76	.74
Winchester, Mich.	PM .76	.78
Wayne, Mich.	PM 1.07	.92

18825. To establish on **sand, viz.: Blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica**, carloads, from Campbells and Centreton, Ind., to Mattoon, Ill., rate of 176c per net ton. Present rate, 370c per net ton.

18826. To establish on **sand, viz.: Blast,: core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica**, carloads, Campbells and Centreton, Ind., to points in Illinois and Iowa. Present and proposed rates:

To—	——Rates—— Prop.	Pres.	Sixth class
Aurora, Ill.	227	252	21½
Batavia, Ill.	227	*21½	21½
Belvidere, Ill.	240	*22½	22½
Clinton, Iowa	265	328	24½
Davenport, Iowa	265	328	24½
Dixon, Ill.	240	265	23½
Dubuque, Iowa	265	328	24½
Elgin, Ill.	227	*21½	21½
Freeport, Ill.	240	328	23½
Fulton, Ill.	265	328	24½
Galena, Ill.	265	328	24½
Geneva, Ill.	227	328	21½
Havana, Ill.	227	*22	22
Keithburg, Ill.	265	328	24½
Lyons, Ohio	265	*24½	24½
Moline, Ill.	265	328	24½
Monmouth, Ill.	265	*24½	24½
Muscatine, Iowa	265	328	24½
Rockford, Ill.	240	*22½	22½
Rock Island, Ill.	265	328	24½
St. Charles, Ill.	227	277	21½

*Sixth class.

18827. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel**, carloads, Dayton, Ohio, to Oakland, Ohio, rate of 70c per net ton. Present rate 230c per net ton.

18829. To establish on **sand** (all kinds) and **gravel**, carloads, Rittenours, Ohio, to points in Ohio, same rates as now apply from Chillicothe, Ohio, per B. & O. Tariff H3336C, I. C. C. WL-9691.

18830. To establish on **crushed stone**, Centerville, Ohio, to points in Ohio and Indiana, rates as shown below:

Destination—	—Per net ton— Pres.	Prop.
Columbia Park, Ohio	$2.80	$ .95
Aurora, Ind.	2.90	1.00
Dillsboro, Ind.	3.00	1.05

Route—Penna. R. R., East Norwood, Ohio, and B. & O. R. R.

18831. To establish on **crushed stone**, carloads, Whitehouse, Ohio, to St. Louis, Mich., rate of 145c per net ton. Route: Wabash Ry.-Toledo, O.-P. M. Ry. Present rate, 20½c.

18832. To establish on **crushed stone, crushed stone screenings and tailings**, carloads, Waterville, Ohio, to Dayton, Ohio, rate of 125c per net ton. Route: Via N. Y. C. & St. L. R. R.-B. & O. R. R. Present rate, sixth class.

SOUTHWESTERN FREIGHT BUREAU DOCKET

15147. **Sand and gravel**, from Arkansas points to Memphis, Tenn. To establish a rate of 4c per 100 lb. on sand and gravel, carloads, minimum weight 80,000 lb., or if marked capacity is less than 80,000 lb., marked capacity will govern, from Levesque, Ark., and intermediate points, to Memphis, Tenn. The proposed rate, it is stated, is necessary to meet competition from points east of the Mississippi river to Memphis, Tenn.

15170. **Sand**, from Shirk, Okla., to points in Missouri. To establish a rate of 10½c per 100 lb. on sand, carloads (See Note 2), from Shirk, Okla., to Wheaton and Ridgley, Mo. It is contended that the present rate is prohibitive.

15171. **Sand and gravel**, from Oklahoma points to Arkansas points. To establish a rate of 8c per 100 lb. on sand and gravel, straight or mixed carloads, minimum weight 80,000 lb., except where marked capacity of car is less, the marked capacity will apply, from Muskogee, Byllesby, Ft. Gibson, Keough and Kriener, Okla., to Gentry, Decatur, Gravette and Sulphur Springs, Ark. It is desired to publish to points named above the same rate that will be published to Gravette, Ark., via the St, L.-S. F. Ry.

Committee to Investigate Illinois Gravel and Stone Rates Will Meet on July 16

AS the result of a conference at Springfield, Ill., of carriers and shippers before Examiner Fuller of the Interstate Commerce Commission and Mr. Zorn, assistant rate expert of the Illinois commission, with respect to interstate and state rates on sand, gravel and crushed stone to destinations in Illinois south of the line of the Pennsylvania between St. Louis and Terre Haute, a committee of carriers and shippers was appointed to make a report of recommended rates on this traffic. The committee will meet with representatives of the two commissions at room 2001, City Hall Square building, Chicago, July 16. It expects to be in session about a week and suggestions from all interested parties will be received. The report of the committee will be served on all interested parties and considered later at a general conference. The action was taken in connection with I. and S. No. 3093 and the Illinois commission cases, 17841 and 17863.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Gassing Concrete Products

Combating One of the Most Irritating Problems of Products Manufacturers, That of Efflorescence, with Carbon Dioxide

By W. D. M. Allan

Manager, Cement Products Bureau, Portland Cement Association

IN nearly all parts of the world where the rainfall is 15 in. a year or more there is some trouble with efflorescence in masonry materials and even in some of the arid regions where the rainfall is concentrated on a short period afflorescence appears.

According to Technologic Paper No. 349 issued by the United States Bureau of Standards, reporting on the physical properties of commercial limestones, "Efflorescence is a growth of crystals on the surface and in the pores of the masonry where a salt solution evaporates. The solvent carrying the salt is probably always water. The source of the salt may be varied, but in most cases it is leached from the masonry walls by water as it slowly percolates through the pores. No building material is entirely free from water-soluble salts and the small amounts of such which usually appear in chemical analyses, as a few tenths of 1%, are sufficient when leached out and concentrated at some point on the surface to cause efflorescence."

It is interesting to note from this report that no building material is entirely free from water-soluble salts and this in turn means that when the material is used under the right kind of conditions these soluble salts will form efflorescence or "bloom." As long as the salts remain distributed throughout the masonry material, no efflorescence will appear, but as soon as water gets into the material and comes to the surface through evaporation it will carry with it salts which may be soluble or insoluble. If the salts are soluble, the efflorescence is likely to be washed off with the next rain and the discoloration due to the efflorescence will not be noticeable. If the salts deposited on the surface are only slightly soluble or are insoluble, they are likely to build up until sufficient of the efflorescence appears to give the wall an unsatisfactory appearance.

Two things are necessary, then, for efflorescence: first, soluble salts in the masonry material; second, the passage of water in and out of the material. Since the soluble salts are an integral part of the natural stone, clay products, or concrete and cannot be eliminated, it seems that the only way to control efflorescence is to control the passage of water in and out of the material. Dense concrete is much less liable to efflorescence than porous concrete so that all of the factors that produce desnity in concrete will have a tendency to reduce efflorescence.

Effect of Aggregate Grading on Efflorescence

The first one to be considered is grading of the aggregate. Efflorescence in roofing tile, concrete block, cast stone and stucco most often occurs when the aggregate is too fine. A properly graded aggregate that has sufficient material passing a 48-mesh screen to make a good plastic mortar and that has sufficient coarse material in it so that a strong dense concrete can be made with a minimum amount of mixing water will be most satisfactory. For products such as those mentioned above, using fine materials, the concrete should be mixed from three to five minutes to produce a thoroughly dense mix. The more thoroughly the concrete is compacted either by tamping, vibrating or rodding, the denser it will be and consequently the less water will pass through it. Any excess of mixing water used in the mix evaporates, leaving pores in the concrete, and will tend later to produce efflorescence.

Moist curing for several years has been proved by test to be a vital factor in producing dense concrete. Two slabs of concrete made exactly the same, one allowed to dry out immediately after molding and the other kept damp for seven days, show as much as 50% to 75% difference in the amount of moisture absorbed at 28 days.

In some products it is not always possible to use the best gradings of material or the proper water content and still get the desired surface effects and it has been found that efflorescence can be controlled by another method described as "gassing." In concrete products the water that comes to the surface carries with it a soluble calcium hydroxide or lime water. When this lime water comes in contact with the carbon dioxide in the air, it forms a relatively insoluble calcium carbonate. Some manufacturers of roofing material place their products in a curing room a few hours after they are made and while they are curing saturate the air with carbon dioxide. This gas combines immediately in the pores of the concrete, either at the surface or just below it, with the calcium hydroxide, forming a calcium carbonate below the surface where it is not noticeable. The formation of this calcium carbonate tends to fill the pores and thus render it more difficult for moisture to penetrate the concrete later and bring to the surface additional calcium hydroxide which would form efflorescence when exposed to the carbon dioxide of the air months after the roof had been placed.

There is not much experimental data available on the best conditions under which to cure concrete products in the presence of carbon dioxide in order to obtain the best results. However, manufacturers of cast stone, roofing tile, cement-asbestos products, floor tile and cement shingles who are having trouble with efflorescence problems may find it worth while to so some experimental work with gassing. The gas can be obtained either by buying tanks of liquid carbon dioxide from commercial laboratories that prepare it and furnish it to soda fountain operators, or it can be obtained by burning a very high grade of coke in the curing room. It is claimed by some manufacturers

that efflorescence has been controlled completely by this method and several others claim that practically all efflorescence has been eliminated. In using the liquid carbon dioxide that comes in high pressure tanks, the assistance of an engineer familiar with the material should be employed to get the work started properly and to reduce the amount of the gas required.

American Concrete Institute's "Concrete Primer"

THE American Concrete Institute has recently published a "Concrete Primer" in the form of a 36-page booklet of 142 questions and answers. The foreword states that the book was originally intended for the beginner in concrete construction, but the scope of the primer widened until in its final form it is hoped that it will be of use also to the expert in the field as well. Unquestionably the book answers clearly and concisely many questions which before have been only too little understood by the man in the street. The book, which is well illustrated with diagrams and pictures, is the work of T. R. McMillan, director of research of the Portland Cement Association. It may be obtained for 25 cents at the American Concrete Institute in Detroit.

Supplying Philadelphia's Demand for Ready Mixed Concrete

Charles Warner Co. Opens Second Ready-Mixed Concrete Plant in Philadelphia

THE increasing demand for ready-mixed concrete in Philadelphia has prompted the Charles Warner Co. to increase their facilities for supplying ready-mixed aggregate to the numerous concrete building jobs in progress in Philadelphia, Camden and vicinity. When the company first realized that there would be a considerable market in Philadelphia for mixed concrete, they equipped their existing Marlborough street plant with modern equipment to furnish the different grades of concrete which various concrete users were demanding. The company installed a 4000-lb. weighing batcher to weigh out the gravel, a 2500-lb. weighing batcher for the sand and a 2000-lb. weighing batcher to take care of the cement. All of these batchers were installed on the existing steel and wood bins at the plant and were so arranged that they would discharge directly into a 1½-yd. Ransome mixer. The plant was then rebuilt so that it could be operated entirely by one man. This man weighs out the stone, sand and cement and takes care of the admixture (usually in the form of hydrated lime) which is required in the mix by some of the contractors. He also operates the discharge of the mixer.

The output of this plant is now rated at 450 yd. of mixed concrete per day. This output has often been bettered, as it is possible to speed up production when necessary.

In addition to the equipment which has just been described, the Charles Warner Co. also installed a 5000-lb. double weighing batcher to take care of the batching of sand and stone. Due to the considerable demand for batched material, it was necessary to install this additional equipment so that good service could be given the customers.

Second Plant Necessary

The business continued to grow until it was found necessary to build another plant. The Charles Warner Co. entrusted to the Blaw-Knox Co. of Pittsburgh the job of designing and building a plant which was to duplicate or better the performance of the equipment at the Marlborough street plant. This new plant is located at Bainbridge street.

At the Bainbridge street plant, a 300-ton Blaw-Knox all steel, self-cleaning bin was equipped with a 6000-lb. duplex weighing batcher to weigh out the sand and gravel, and with a 2000-lb. weighing batcher to handle the cement, all of which charged directly into a 1½-yd. Ransome mixer, which is supported on a sub-structure designed and erected by the Charles Warner Co., so that the loading of trucks could be accomplished in the quickest possible time.

This new plant was erected mainly to furnish central mixed concrete for the construction of the south end of the Broad street subway in Philadelphia, which work is being done by Heyman and Goodman of New York City. The average plant capacity of 450 cu. yd. per day was more than necessary to take care of this job and the company was able to market its ready-mixed concrete for a variety of work in and around Philadelphia, including street paving work, concrete side walls for bank vaults, sidewalks, curb and gutter construction, foundation walls and building construction. The company has found the weighing batcher entirely satisfactory, as it has given better results than equipment in use before, since the weighing feature has practically overcome the error of the bulking action of the concrete aggregates, which is always a handicap.

The Bainbridge Street ready-mixed concrete plant of the Charles Warner Co., showing the batchers above the mixer, which discharges directly to the trucks

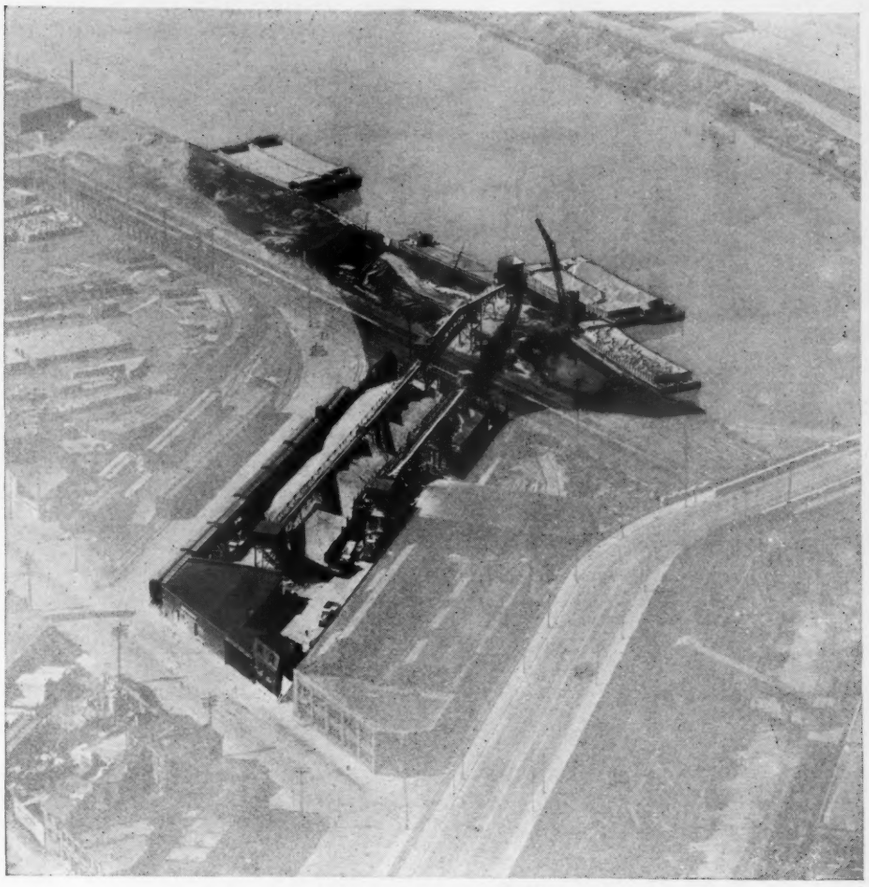
As in the case of the Charles Warner Co. in Philadelphia, dealers find a growing demand for ready-mixed concrete in nearly all parts of the country, and it is apparent that a need has arisen for efficient and economical plants such as the two Philadelphia plants described. Probably 75% of the towns and cities in the United States contemplate some sort of a paving or construction program, and it seems evident that a considerable market must exist in every city with a population of 50,000 or more for the establishment of a central concrete mixing plant. In the next few years most of the cities of this size will see a repetition of the development of the ready-mixed concrete business similar to the Charles Warner Co. plants, although many localities will not require facilities of the size of the Philadelphia plants. To meet the needs of various localities, manufacturers of batching and mixing equipment have already on the market lines for all desired capacities. For the dealer, whether he be sand and gravel producer, general building supply dealer or cement products manufacturer, the idea of the ready-mixed concrete is a good one for rendering just another service to the customer, and a service which is certain to be appreciated, and will continue to draw new customers.

Northwest Concrete Products Men to Meet at Mt. Rainier

THE mid-summer convention and sales conference of the Northwest Concrete Products Association will be held at Paradise Valley on Mount Rainier, July 16-17, and the program for business and entertainment is now being arranged. W. D. M. Allan, manager of the products bureau of the Portland Cement Association, will deliver a series of talks at the meeting, and he is making a special trip from the east to attend the sessions. Every concrete products manufacturer, whether a member of the association or not, has been invited to attend the convention and sales conference.—*Seattle* (Wash.) *Journal of Commerce.*

Clinker Cement Brick Plant at Pocatello, Idaho

THE Intermountain Brick Co.'s Pocatello, Idaho, plant is now in operation and turning out a product which is attracting the favorable attention of builders, architects and construction men in this section of Idaho. The company purchased the old Pocatello brick plant located in Alameda on the Yellowstone highway and now has some 10 men employed. The company manufactures clinker-cement brick. The clinker brick is a composition of cement and cinders which are ground together, put under a pressure of 70 tons and then dried in a huge cylinder under a pressure of 125 lb. for three hours. The bricks remain in the drying cylinder eight hours and are then ready for the market.



A view of the Bainbridge Street plant of the Charles Warner Co. from the air

C. A. Breer is manager of the Pocatello plant and states that some 10 men are now employed. He stated that the clinker brick has all of the qualifications of common clay brick and in addition to this its insulating qualities are far superior to the clay brick. He said that the Santa Fe railroad had selected clinker brick for all its ordinary brick work.

Mr. Breer said that the capacity of the Pocatello plant, which is the only one in operation in South Idaho with the exception of a clay brick plant at Burley, is about 40,000 brick every 24 hours. One sack of cement is used in the manufacture of every 200 bricks, he said, the cinders being secured from the Short Line.

New Block Plant Opened Near Philadelphia

THE Penn Building Block Co. of Philadelphia has recently opened a new plant at Primos Station, Penn., on a tract of eight acres controlled by the company. This is the company's second unit, the first being in North Philadelphia. The two plants are now turning out 18,000 blocks per day. Raymond Weeks is president of the company.—*Upper Darby* (Penn.) *Herald-Tribune.*

Colored Concrete Posts for Lincoln Highway Markers

A NEW and uniform system of marking the Lincoln Highway with concrete posts has been decided upon and the work will go forward shortly. Early in the spring it was announced that designs for the new markers were desired, and many hundred plans were submitted. The directors selected the one offered by Jens Jensen, an architect of Ravinia, Ill. The contract for producing the new markers was awarded to Martin Hoffman of the Detroit Cast Stone Co., Detroit, Mich.

The posts will be square and on the side facing the motorist will appear an arrow, cast of blue concrete, directing whether he shall proceed straight ahead or turn to left or right. On the face there will be the familiar red, white and blue marker, each division being of concrete, above which there will be a bronze medallion of Lincoln, 4 inches in diameter, the Emancipator's head being encircled by "This Highway Dedicated to Abraham Lincoln."

Because of the many new problems presented in fabricating such a marker, the Portland Cement Association has volunteered to have its technical department supervise construction of the posts.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	1.75	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.		1.30	1.10	1.00	1.00	
Frederick, Md.	.50@ .75	1.35@1.45	1.15@1.25	1.10@1.20	1.05@1.15	1.05@1.10
Ft. Spring, W. Va.	.35	1.30	1.30	1.25	1.20	1.15
Munns, N. Y.	1.00	1.25	1.25	1.25	1.15	
Prospect, N. Y.	1.00	1.40	1.25	1.25	1.25	
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.75	1.35	1.15	.95	.85	1.35
Walford, Penn.			1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.						.50@1.50
Alton, Ill.	1.85		1.85			
Columbia and Krause, Ill.	1.05@1.40	.95@1.50	1.15@1.50	1.05@1.50	1.05@1.50	
Cypress, Ill.	1.00@1.25	1.00@1.25	1.20@1.25	1.20@1.25	1.20@1.25	1.35
Dubuque, Iowa (h)	.85	1.00	1.35	1.35	1.35	1.35
Greencastle, Ind.	1.35	1.10	1.10	1.00	1.00	1.00
Lannon, Wis.	1.00	1.00	1.00	.90	.90	.90
Linwood, Iowa	1.10	1.50	1.50	1.30	1.40	1.40
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.		.90@1.00	1.00@1.10	.90@1.00	.85@ .90	.85@ .90
Northern Ohio Points	.85@1.15	1.25	1.15	1.15	1.15	1.15
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	1.10
Stone City, Iowa	.75		1.20	1.10	1.00	
Thornton, Ill.	.90	1.00	1.25	1.25	1.25	1.25
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Canada (m)	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90@1.20			1.75		1.75
Waukesha, Wis.		.90	.90	.90	.90	
Winona, Minn.	1.00	1.20	1.30	1.40	1.40	1.40
Wisconsin Points	.50		1.00	.90	.90	
Youngstown, Ohio	.70j	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h
SOUTHERN:						
Cartersville, Ga.	1.35	1.65	1.65	1.35	1.15	
Chico, Texas	1.00	1.30	1.25	1.20	1.10	1.05
Cutler, Fla.	.50r@ .60r			1.75r		1.10r
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	
Graystone, Ala.		Crusher run, screened, $1 per ton				
Kendrick and Santos, Fla.		3½ in. and less, $1 per ton				
Olive Hill, Ky.		1.00	1.00	1.00	1.00	1.00
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.25	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.25		1.25	1.25	1.00	
Rock Hill, St. Louis, Mo.	1.00	1.25	1.00@1.25	.90@1.25	.90@1.25	.90@1.25
Sugar Creek, Mo.	.75	1.00	1.20	1.20	1.20	1.20

(r) Cubic yard.

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35		1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.65	1.35	1.25	
New Britain, Plainville, Rocky Hill, Wallingford, Meridan, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	1.05
Northern New Jersey	1.40@1.45	1.40@2.10	1.90	1.40@1.50	1.40@1.50	
Richmond, Calif.	.75		1.00	1.00	1.00	
Spring Valley, Calif.	.75	1.10	1.10	1.10	1.10	
Springfield, N. J.	1.35@1.50	2.10	2.00	1.60	1.60	
Toronto, Canada (m)		5.80	4.05	4.05		
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	
Cayce, S. C.—Granite			1.80	1.80	1.65	
Eastern Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	1.00		2.35			
Lithonia, Ga.—Granite	.75a	2.00b	2.00	1.40	1.40	1.25
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	
Middlebrook, Mo.	3.00@3.50		2.00@2.25	2.00@2.25		1.25@3.00
Richmond, Calif.—Quartzite	.75		1.00	1.00	1.00	
Somerset, Penn. (sand-rock)			1.50 to 1.85			
Toccoa, Ga.			1.30	1.25	1.25	1.25

(a) Sand. (b) to ¾ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) 1 in. to ¼ in., 1.45; 2 in. to ¼ in., 1.35. High calcite fluxing stone, 1.40. (h) Less 10c discount. (j) Less 10% net ton. (l) Less .05. (m) Plus .25 per ton for winter delivery. (n) Crusher run for ballast, .85. (p) Carload prices. (q) Crusher run, 1.40; ¼-in. granolithic finish, 3.00. (r) Cubic yd.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$; 90% thru 100 mesh.. 6.00

Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh 1.50

Blackwater, Mo.—100% thru 4 mesh.. 1.00

Branchton, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh 5.00

Cape Girardeau, Mo.—Analysis, $CaCO_3$, 93½%; $MgCO_3$, 3½%; 90% thru 50 mesh 1.50

Cartersville, Ga.—50% thru 50 mesh.... 1.50

Pulverized, per ton 2.00

Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk 2.50

Cypress, Ill.—Analysis, 88% $CaCO_3$; 10% $MgCO_3$; 50-90% thru 4 mesh.. 1.25
50-90% thru 100 mesh 1.35

Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked 5.00

Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags 3.95

Bulk 2.70

Jamesville, N. Y.—Analysis 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags 4.25

Joliet, Ill.—Analysis, 52% $CaCO_3$; 44% $MgCO_3$; 90% thru 50 mesh; bulk 2.50

Knoxville, Tenn.—80% thru 100 mesh; bags, 1.25; bulk 2.70

Linwood, Iowa—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 200 mesh, bags, per ton 6.00
90% thru 20 mesh, bulk, per ton..... 1.50

Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk 1.75

Marl—Analysis, 95% $CaCO_3$; 0% $MgCO_3$; bulk 2.25

Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton 2.00

Middlebury, Vt.—Analysis 99.05% $CaCO_3$; 90% thru 50 mesh; bulk, 4.00; paper bags 5.00

Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk 1.35@ 1.60

Olive Hill, Ky.—90% thru 4 mesh..... 1.00

Piqua, Ohio—Total neutralizing power 101.12%; 99% thru 10, 60% thru 50; 45% thru 100 2.50

100% thru 10, 90% thru 50, 70% thru 100; bags, 5.00; bulk 3.50

100% thru 4, 30% thru 100, bulk..... 1.50

Rocky Point, Va.—Analysis, $CaCO_3$, 97%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk 2.00

Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk 2.50

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98% $CaCO_3$; 1%, $MgCO_3$; 95% thru 10 mesh..... 1.50

(Continued on next page)

Agricultural Limestone

Chico and Bridgeport, Tex. — 50% thru 100 mesh	1.50
Danbury, Conn.; Adams, Ashley Falls and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$, 5% $MaCO_3$; 90% thru 100 mesh, bulk	3.50
100-lb. paper bags	4.75
100-lb. cloth bags	5.25
(All prices less .25, 15 days.)	
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Ft. Spring, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 50 mesh	1.00
Kansas City, Mo. — 50% thru 100 mesh	1.00
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Linwood, Iowa—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 10 mesh, per ton	1.25
90% thru 4 mesh, per ton	1.10
Marblehead, Ohio—90% thru 100 mesh	3.00
90% thru 50 mesh	2.00
90% thru 4 mesh	1.00
McCook, Ill.—90% thru 4 mesh	.90
Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Logansport, Ind.—85% thru 10 mesh, 20% thru 100 mesh	1.50
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags	5.00
Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.10
90% thru 50 mesh	1.65
Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	1.10@1.70

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00
Joliet, Ill. — Analysis, 50% $CaCO_3$; 42% $MgCO_3$; 95% thru 100 mesh; paper bags (bags extra)	3.50
Linwood, Iowa—Analysis 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; paper sacks	6.00
Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks	4.25
Piqua, Ohio, sacks, 4.50@5.00; bulk	3.00@ 3.50
Rocky Point, Va.—85% thru 200 mesh, bulk	2.25@ 3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J.	*1.75@ 2.25
Estill Springs and Sewanee, Tenn.	1.50
Franklin, Penn.	2.00
Klondike, Mo.	2.00
Massillon, Ohio	3.00
Michigan City, Ind.	.30@ .35
Ohlton, Ohio	2.50@ 3.00
Ottawa, Ill.	1.25
Red Wing, Minn.	1.50
San Francisco, Calif.	4.00@ 5.00
Silica and Mendota, Va.	2.00
St. Louis, Mo.	2.00
Utica and Ottawa, Ill.	.75@ 1.00
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.50
Dresden, Ohio		1.25
Eau Claire, Wis.		4.30
Estill Springs and Sewanee, Tenn.	1.35@1.50	1.35@1.50
Franklin, Penn.		1.75
Massillon, Ohio		2.00
Michigan City, Ind.		.30
Montoursville, Penn.		1.25
Ohlton, Ohio	2.00	2.00
Ottawa, Ill.	3.25	1.25
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N.J.	.65	.55	1.00	1.35	1.40	
Attica and Franklinville, N. Y.	.65	.65	.75	.65	.65	.65
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05		1.05
Erie, Penn.	.60	.85		1.40		
Leeds Junction, Me.		.50		1.75	1.25	1.00
Machias Jct., N. Y.	.75	.65	.65		.65	.65
Montoursville, Penn.	1.00	.80	.75	.65	.65	.60
Northern New Jersey	.50	.50	1.25	1.35	1.25	
Somerset, Penn.		2.00				
Troy, N. Y.	.50@ .75*	.50@ .75*	.80@1.00*	.80@1.00*		.80@1.00*
F. o. b. boat, per yd.	1.50	1.50	1.75	1.75		1.75
Washington, D. C.	.55	.55	1.20@1.50	1.20	1.00	1.00
CENTRAL:						
Attica, Ind.			All sizes .75@.85			
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.50	.35	.20	.50	.60	.60
Barton, Wis.		.40	.60	.65	.65	.65
Chicago District	2.00j					
Columbus, Ohio¶		.70	.70	.70	.70	
Des Moines, Iowa		.40	1.50	1.50	1.50	1.50
Eau Claire, Chippewa Falls, Wis.		.40	.55	.95	.85	
Elkhart Lake, Wis.	.60	.40	.50	.60	.50	.50
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Grand Haven, Mich.		.60@ .80	.70@ .90	.70@ .90		.70@ .90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio		1.00	1.00		1.00	
Hersey, Mich.		.50		.60		.70
Humboldt, Iowa	.35	.35	1.35	1.35	1.35	1.35
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Mankato, Minn.		.45g		.60@1.25h	.70@1.25	1.25c
Mason City, Iowa		.50	.85	1.30	1.25	1.25
Mattoon, Ill.			.75@.85 all sizes			
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn.	.65*	.65*	1.75*	1.75*	1.75*	1.75*
St. Louis, Mo.	1.20e	1.45f	1.55a	1.45	1.45	1.45
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	2.75	.60	.85	.75	.75	.75
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.15	1.10
SOUTHERN:						
Brewster, Fla.	.50	.50	3.00	3.00		
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.			River sand and gravel, all sizes, 1.40			
Eustis, Fla.		.45				
Fort Worth, Tex.	.75	1.00	1.00	1.00	1.10	1.10
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.20
Macon, Ga.		.50		.90	.90	
New Martinsville, W. Va.	1.10	1.00		1.30	1.10	.90
Roseland, Fla.	.15	.15	1.25	.75	.65	.65
WESTERN:						
Kansas City, Mo.	.70	.70@ .75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10@ .40	.10@ .40	.50@1.00	.50@1.00	.50@1.00	.50@1.00
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Otay, Calif.		.35@ .50	.60	.60	.60	.60
Phoenix, Ariz. (k)	1.25*	1.15*	1.50*	1.25*	1.15*	1.10*
Pueblo, Colo.	.80	.60		1.20		1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			Dust to 3 in., .40			
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.85
Burnside, Conn.		.75*				
Des Moines, Iowa				.50		
Dresden, Ohio				.70	.65	
Eau Claire, Chippewa Fls., Wis					.65	
Fort Worth, Texas						.65
Gainesville, Texas						.55
Grand Rapids, Mich.				.50		
Hamilton, Ohio					1.00	
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Macon, Ga.	.35					
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Somerset, Penn.		1.85@2.00		1.50@1.75		
Steilacoom, Wash.	.25					
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.40	.40	.60	.60	.60	.60
York, Penn.	1.10	1.00				

*Cubic yd. ‡Delivered on job by truck. (a) ⅝-in. down. (b) River run. (c) 2½-in. and less. ¶By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramec River. (g) Washed and screened river sand. (h) ¾-in. to ¼-in. (j) Lake sand, 1.75, delivered. (k) 60-70% crushed boulders.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.00	2.00	2.25			4.00	
Beach City, Ohio	1.75	1.75		1.75@2.00	1.75@2.00		1.65
Dresden, Ohio	1.25@1.50	1.25@1.50	1.50@1.75	1.00@1.25			
Eau Claire, Wis.						3.00	
Elco & Tamms, Ill.	Ground silica per ton in carloads—18.00@31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.10@1.50	1.25@2.00	2.00			2.75@3.00	
Massillon, Ohio	2.00	2.00		2.00	2.00		
Michigan City, Ind.				.30@ .35			
Montoursville, Penn.				1.35@1.50			
New Lexington, O.	2.00	1.25					
Ohlton, Ohio	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Ottawa, Ill.	1.00	1.25	1.50	1.75	1.25	3.50	2.00
Red Wing, Minn. (d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50@5.00†	3.50@5.00†	3.50@5.00†	
Silica, Mendota, Va.	Potters flint, 8.00@10.00g						
Utica & Ottawa, Ill.	.40@1.00f	40.@1.00f	.75@1.00	.40@1.00f	.60@1.00f	2.23@3.25	1.00@3.25
Utica, Ill.	.60	.70		.75	1.00		
Warwick, Ohio	1.50*@2.00	1.50*@2.00		1.50*@2.00			
Zanesville, Ohio	2.00	1.50	2.00	2.50	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (d) Filter sand, 3.00. (e) Filter sand, 3.00@4.25. (f) Crude and dry. (g) also 12.00@14.00.

Crushed Slag

City or shipping point EASTERN:	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
Buffalo, N. Y., Erie and Dubois, Pa.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.00	1.00		1.25			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.35	1.35	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.		1.45*		1.45*	1.45*	1.45*	
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15
Woodward, Ala.	2.05*	.80*	1.35*	1.25*	.90*	.90*	

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

EASTERN:	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Lime Ridge, Penn.					5.00			
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[13]
Williamsport, Penn.	10.00@11.00	8.50@9.00	8.50@9.00		7.00	9.00	5.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50@9.50[7]	8.50@9.50[7]	8.50@10.50[7]	8.00	9.25	7.00	1.40[5]
CENTRAL:								
Afton, Mich.							7.50	1.35
Carey, Ohio	11.50	7.50	7.50			8.00		
Cold Springs, Ohio		8.00	8.00					
Gibsonburg, Ohio	11.50				8.00	10.00		
Huntington, Ind.	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Luckey, Ohio[6]	12.50							
Milltown, Ind.		8.50@10.00		10.00[8]			8.50[22]	1.35[10]
Ohio points	11.50	7.50	7.50	12.00	8.00	11.00	7.50	1.50[16]
Scioto, Ohio		7.50	7.50	8.50	8.25	.62½	7.00	1.50
Sheboygan, Wis.		10.50	10.50				9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	7.50	7.50	12.50	8.00	10.00[9]	9.00	1.50[3]
SOUTHERN:								
El Paso, Texas							7.00	
Frederick, Md.		8.00@9.50	8.00@9.50			9.50[15]	7.00[15]	
Graystone & Landmark, Ala.	12.50	9.00		12.50			7.50	1.35
Keystone, Ala.	19.00	9.00	9.00	10.00			7.50	1.35
Knoxville, Tenn.	19.25	8.50	8.50	8.50			6.00	1.15
Ocala, Fla.		10.00	9.00				10.00	1.40
WESTERN:								
Kirtland, N. M.							15.00	
Los Angeles, Calif.	15.00	14.00	12.00	18.00			13.50	
San Francisco, Calif.	19.50	16.00	12.50	16.00@19.50	14.50	.90[17]	14.50	1.85[17]
Tehachapi, Calif.[18]	17.00	15.00	12.00@15.00[11]	17.00	16.00		16.00	2.00
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel; in bbl. .95. [5] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9]80-lb. [10] To 1.50. [11] Refuse or air slack, 10.00@12.00. [12] To 3.00. [13] Delivered in Southern California. [15] To 8.00. [16] To 1.70. [17] Less credit for return of empties. [22] To 9.00. [30] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing Sand	Traction
Utica & Ottawa, Ill.	1.00@ 3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:
- Crude talc (for grinding) 5.00@50.00
- Ground talc (20-50 mesh), bags 5.75@ 8.00
- Ground talc (150-200 mesh), bags 6.50@15.50
- Pencils and steel crayons, gross .75@ 2.75

Chester, Vt.:
- Ground talc (150-200 mesh), paper bags 9.00@10.00
- Same, burlap bags, bags extra 8.00@ 9.00

Chicago and Joliet, Ill.:
- Ground (150-200 mesh), bags 30.00

Cromleys Mt., Md.:
- Crude talc 63.00

Dalton, Ga.:
- Crude talc (for grinding) 5.00
- Ground talc (150-200 mesh), bags 12.00
- Pencils and steel worker's crayons, per gross 1.00@ 2.50

Emeryville, N. Y.:
(Double air floated) including bags;
- 325 mesh 14.75
- 200 mesh 13.75

Glendon, N. C.:
- Ground talc (150-200 mesh), bulk 6.00@10.00
- Ground talc (150-200 mesh), bags 8.00@14.00
- Pencils and steel crayons, gross 1.05@ 2.00
- Blanks, .08 per lb.; cubes 50.00

Hailesboro, N. Y.:
- Ground white talc (double and triple air floated) 200-lb. bags, 300-350-mesh 15.50@20.00

Henry, Va.:
- Crude (mine run) 3.50@ 4.00
- Ground talc (150-200 mesh), bags 7.50@14.00

Joliet, Ill.:
Ground talc (150-200 mesh) in bags:
- California white 30.00
- Southern white 20.00
- Illinois talc 10.00

Keeler, Calif.:
- Ground (200-300 mesh), bags 20.00@30.00

Natural Bridge, N. Y.:
- Ground talc (300-325 mesh), bags 12.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

- Columbia, Tenn.—B.P.L. 65-70% 3.50@ 4.50
- Gordonsburg, Tenn.—B.P.L. 65-70% 3.75@ 4.00
- Mt. Pleasant, Tenn.—B.P.L. 72% 5.00@ 5.50
- Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72% 5.00
- B.P.L. 75% 6.00
- Twomey, Tenn.—B.P.L. 65%, 2000 lb. 8.00@ 9.00

Ground Rock

(2000 lb.)

- Centerville, Tenn.—B.P.L. 65% 8.00
- Gordonsburg, Tenn.—B.P.L. 65-70% 4.00@ 4.50
- Mt. Pleasant, Tenn.—B.P.L. 72% 5.00@ 5.50
- Twomey, Tenn.—B.P.L. 65% 8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

- Florida — F.o.b mines, gross ton, 68/66% B.P.L., Basis 68% 3.25
- 70% min. B.P.L., Basis 70% 3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

- Pringle, S. D.—Mine run, per ton 125.00
- Punch mica, per lb. .06
- Scrap, per ton, carloads 20.00
- Rumney Depot, N. H.—Per ton,
- Mine run 300.00
- Clean shop scrap 25.00
- Mine scrap 22.50@24.00
- Roofing mica 37.50
- Punch mica, per lb. .12

Cut mica—50% from Standard List.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt. — English pink, English cream and coral pink	¶12.50@‖14.50	¶12.50@‖14.50
Brighton, Tenn.—Pink marble chips	§3.00	§3.00
Crown Point, N. Y.—Mica spar		9.00@10.00
Davenport, Ia.—White limestone, in bags	6.00	6.00
Easton, Penn.		8.00@ 9.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio—Concrete facings and stucco dash		11.00@18.00
Middlebrook, Mo.—Red		20.00@25.00
Middlebury, Vt.—Middlebury white	¶9.00@‖11.00	¶9.00@‖11.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		4.00@ 5.50
Phillipsburg, N. J.—Royal green granite		14.00@18.00
Randville, Mich.—Crystalite crushed white marble, bulk	4.00	4.00@ 7.00
Rose pink granite, bulk		12.00
Stockton, Calif.—"Natrock" roofing grits		12.00@18.00
Tuckahoe, N. Y.—Tuckahoe white	10.00	
Warren, N. H.		¶7.90@‖8.95
Wauwatosa, Wis.		20.00@32.00
Wellsville, Colo. — Colorado Travertine Stone	15.00	15.00

†C.L. L.C.L. 16.00.
§Bulk, car lots, minimum 30 tons.
¶C.L. ‖L.C.L.

Potash Feldspar

Auburn and Topsham, Me. — Color white, 98% thru 140-mesh	19.00
Buckingham, Ore.—White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white; analysis, K_2O, 9.63%; Na_2O, 1.01%; SiO_2, 69.72%; Fe_2O_3, .00%; Al_2O_3, 18.6%; bulk (crude)	9.00
East Hartford, Conn.—Color, white, 40 mesh to 200 mesh	15.00@28.00
East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50@14.00; bulk	11.00@12.50
Pulverized. 95% thru 200 mesh; bags, 19.73@23.50; bulk	15.75@22.50
Pulverized, 20% thru 80 mesh; bags, 17.60; bulk	16.50
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; bulk. (Bags 15c extra.)	18.00
Crude feldspar, bulk	9.00
Tenn. Mills—Color, white; analysis K_2O, 10%; Na_2O_3, 3%; 68% SiO_2; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00

Chicken Grits

Afton, Mich.(Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Chico and Bridgeport, Tex.—Hen	¶9.00
Baby chick, per ton	¶8.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass. (Limestone	‡7.50@*9.00
Davenport, Ia.—(Limestone) bags, per ton	6.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—(Feldspar), per ton, including sacks	14.00
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton	10.00
Randville, Mich.—(Marble), bulk	6.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Waukesha, Wis.—(Limestone), per ton	8.00
Wisconsin Points—(Limestone), per ton	15.00
Winona, Minn.—(Limestone), sacked, per ton, $8.00; bulk, per ton	6.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	9.00@10.00
Anaheim, Calif.	10.50@11.00
Barton, Wis.	10.50
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50@13.50
Detroit, Mich.	13.00@16.00*d
Farmington, Conn.	13.00
Flint, Mich.	18.00†
Grand Rapids, Mich.	12.50@14.50e
Hartford, Conn.	14.00@19.00*
Jackson, Mich.	13.00
Lakeland, Fla.	10.00@11.00
Lake Helen, Fla.	9.00@12.00
Lancaster, N. Y.	12.50
Madison, Wis.	12.50a
Michigan City, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	12.50@15.00*
Portage, Wis.	16.00
Prairie du Chien, Wis.	18.00@22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	16.00
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
Syracuse, N. Y.	13.00@16.00
Toronto, Canada	15.00*
Wilkinson, Fla.	12.00@16.00
Winnipeg, Canada	15.00

*Delivered on job. †5% disc., 10 days. ¶Dealers' price. (a) Less 50c discount per M. 10th of month. (d) 5% disc., 10th of month. (e) Delivered in city limits.

Portland Cement

Prices per bag and per bbl., without bags, net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.	84¼	3.37
Atlanta, Ga.		2.35
Baltimore, Md.		2.15‡@2.25
Birmingham, Ala.		2.10
Boston, Mass.	.68¼	2.13@2.73
Buffalo, N. Y.	.62½	2.00‡@2.50
Butte, Mont.	.90¾	3.61
Cedar Rapids, Iowa		2.24
Charleston, S. C.		2.35
Cheyenne, Wyo.	.64	2.56
Chicago, Ill.	.51¼	2.05
Cincinnati, Ohio		2.22
Cleveland, Ohio		2.24
Columbus, Ohio		2.22
Dallas, Texas		2.00
Davenport, Iowa		2.24
Dayton, Ohio		2.24
Denver, Colo.	.63¾	2.55
Des Moines, Iowa		2.05
Detroit, Mich.		1.90
Duluth, Minn.		2.04
Houston, Texas		2.00
Indianapolis, Ind.	.54¾	2.19
Jackson, Miss.		2.02
Jacksonville, Fla.		2.20
Jersey City, N. J.		2.03‡@2.13
Kansas City, Mo.		1.92
Los Angeles, Calif.	.60	2.40
Louisville, Ky.	.55½	2.22
Memphis, Tenn.		2.04
Milwaukee, Wis.		2.20
Minneapolis, Minn.		2.12@2.22
Montreal, Que.		1.60
New Orleans, La.		2.07
New York, N. Y.	.60¾	1.93‡@2.43
Norfolk, Va.		2.07
Oklahoma City, Okla.		2.46
Omaha, Neb.		2.36
Peoria, Ill.		2.22
Philadelphia, Penn.		2.11‡@2.21
Phoenix, Ariz.		3.26
Pittsburgh, Penn.		2.04
Portland, Colo.		2.80
Portland, Ore.		2.40‡@2.60
Reno, Nev.		2.91
Richmond, Va.		2.24‡@2.40
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.		2.21
Savannah, Ga.		2.50
St. Louis, Mo.		1.95
St. Paul, Minn.		2.12@2.22
Seattle, Wash.		2.40
Tampa, Fla.		2.25
Toledo, Ohio		2.20
Topeka, Kan.		2.41
Tulsa, Okla.		2.33
Wheeling, W. Va.		2.12
Winston-Salem, N. C.		2.29

Mill prices f.o.b. in carload lots, without bags to contractors.

	Per Bag	Per Bbl.
Albany, N. Y.	.43¾	1.75
Bellingham, Wash.		2.10
Buffington, Ind.		1.80
Chattanooga, Tenn.		2.45*
Concrete, Wash.		2.35
Davenport, Calif.		2.45*
Hannibal, Mo.		1.90
Hudson, N. Y.		1.75
Leeds, Ala.		1.65
Lime and Oswego, Ore.		2.50‡
Mildred, Kan.		2.35
Nazareth, Penn.		2.15
Northampton, Penn.		1.75
Richard City, Tenn.		2.05
Steelton, Minn.		1.85
Toledo, Ohio		2.20
Universal, Penn.		1.80

NOTE—Add 40c per bbl. for bags.
*Includes sacks. ‡10c discount, 15 days.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	Gauging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ⅜x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lengths 6'-10'. Per M Sq. Ft.
Acme, Tex.	1.70	4.00	4.00	4.00	4.00	4.50	.....	.....	.....	.....	.....	15.00	20.00
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	.....	.....	.....	.....	11.70u	.....	.....	.....
Blue Rapids, Kan.	1.70	4.00	.....	.....	.....	.....	10.00	.....	.....	.....	.....	15.00	20.00
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	.....	.....	13.50	.....	.....	.....
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.	.....	.....	.....	.....	14.30o	12.30 m	.....	m9.00@11.00o	.....	.....	.....	.....	.....
Delawanna, N. J.	.....	.....	.....	.....	.....	.....	.....	7.25	.....	.....	13.00	14.00	.....
Douglas, Ariz.	.....	.....	6.00	14.50	15.00	.....	18.00	.....	30.00	.....	.....	.....	.....
Fort Dodge, Iowa	1.70	4.00	6.00	9.00	9.00	9.50	.....	.....	.....	19.00	.....	15.00	20.00
Grand Rapids, Mich.	2.65	4.00	6.00	6.00	9.00	9.00	17.65	.....	22.75	19.00	12.00	15.00	18.00
Gypsum, Ohio	1.70@3.00	4.00	6.00	7.00@9.00	9.00	9.00	19.00	7.00	24.50	19.00	.....	15.00	20.00@25.00
Los Angeles, Calif.	.....	7.50@9.00	7.50@9.00	.....	11.50@13.50	.....	.....	.....	.....	.....	.....	.....	.....
Medicine Lodge, Kan.	1.70	4.00	.....	.....	.....	.....	.....	.....	15.00	.....	.....	15.00	20.00
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	.....	20.00	30.00
Portland, Colo.	.....	.....	.....	10.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	9.00	13.40	14.40	.....	15.40	.....	.....	.....	.....	.....	.....
Seattle, Wash. (b)	6.00	10.00	10.00	12.00	13.00	.....	.....	.....	.....	.....	.....	.....	.....
Sigurd, Utah	.....	.....	.....	.....	.....	.....	.....	.....	21.50	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) Hardwall plaster, 13.00; casting, finishing, molding, 14.00. (b) Calacoustic plaster 10.00 at mill; (m) includes paper bags; (o) includes jute sacks; (u) includes sacks.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.	.....	5x8x12—55.00¶	.....
Chicago District	200.00¶	.....	.....
Columbus, Ohio	16.00	.....	.....
Detroit, Mich.	.15@ .17†	.....	.24@.26†
Forest Park, Ill.	21.00*	.....	.....
Grand Rapids, Mich.	15.00*	.....	.....
Graettinger, Iowa	.16@ .18	.....	.....
Indianapolis, Ind.	.10@ .12a	.....	.....
Los Angeles, Calif.	4x8x12—5.00*	4x6x12—4.20*	
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.18@ .20	.....	.....
Tiskilwa, Ill.	.16@ .18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain. (d) 5x8x12—65.00 M, 5½x8x12—68.50 M.

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.	
Red	15.00
Green	18.00
Chicago, Ill.—Per sq.	20.00
Detroit, Mich.—5x8x12, per M	67.50
Houston, Texas—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Waco, Texas:	Per sq.
4x4	.60

Cement Building Tile

Cement City, Mich.:	Per 100
5x8x12	5.00
Chicago District (Haydite):	
4x 8x16, per M	140.00
8x 8x16, per M	220.00
8x12x16, per M	300.00
Columbus, Ohio:	
5x8x12	6.50
Detroit, Mich.:	
5½x8x12, per M	75.00
Grand Rapids, Mich.:	
5x8x12	8.00
Longview, Wash.:	
4x6x12	5.00
4x8x12	6.25
Mt. Pleasant, N. Y.:	Per 1000
5x8x12	78.00
Houston, Texas:	
5x8x12 (Lightweight)	80.00
	Per 100
Pasadena, Calif. (Stone Tile):	Per 100
3½x4x12	3.00
3½x6x12	4.00
3½x8x12	5.50
Tiskilwa, Ill.:	Per 100
8x8	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	Per 1000
3½x6x12	50.00
3½x8x12	60.00
Prairie du Chien, Wis.:	
5x8x12	82.00
5x4x12	46.00
5x8x 6 (half-tile)	41.00
5x8x10 (fractional)	82.00
	Each
Yakima, Wash. (Building Tile):	
5x8x12	.10

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .13; 12-in., .17½; 14-in., .25; 16-in., .32; 18-in., .40; 20-in., .50; 24-in., .80; 26-in., 1.00; 28-in., 1.10; 30-in.	1.25
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per M:	
3 in.	40.00
4 in.	50.00
6 in.	75.00
8 in.	100.00
Waukesha, Wis.—Drain tile, per ton	8.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	.....
Chicago District	16.00	.....
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Clinker	11.00	.....
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50@65.00
Milwaukee, Wis.	14.00	20.00@32.00
Mt. Pleasant, N. Y.	.....	14.00@ 23.00
Omaha, Neb.	18.00	30.00@ 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	14.75	16.50@ 20.00
Portland, Ore.	17.50	23.00@ 55.00
Mantel brick—100.00@150.00		
Prairie du Chien, Wis.	14.00	22.00@ 25.00
Rapid City, S. D.	18.00	30.00@ 35.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in
Detroit, Mich.								15.00 per ton									
Detroit, Mich. (c) Sewer	.10	.12	.22	.30	.40	.60	.90	1.20	.....	1.75	2.00	2.50	3.30	4.50	5.75	6.50	8.00
Culvert	.....	.....	.....	.....	.95	1.25	1.60	.....	.....	2.25	2.50	3.00	3.50	5.00	6.50	8.00	10.00
Grand Rapids, Mich.	4 in. to 12 in., 72% off standard sewer price list; 15 in., 65% off; 18 in. to 24 in., 62% off; 27 in. to 36 in., 60% off																
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.75	.85	.90	1.15	.....	.....	1.60	.....	2.50	.....	.....	.....	.....	.....
Longview, Wash.	Sewer pipe 40% off list; culvert—list																
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.	6 in. to 24 in., $18.00 per ton																
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.	12.00 per ton																
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	.70	1.55	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tacoma, Wash.	.15	.17	.22½	.30	.40	.55	1.20	1.70	.....	2.00	.....	2.75	3.40	.....	6.50	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	1.00	1.13	1.10	1.60	.....	1.90	.....	2.25	3.40	.....	5.50	.....	.....
Yakima, Wash.	.....	.....	.....	.....	.....	.....	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78

(a) 24-in. lengths. (b) Reinforced. (c) Delivered on job; 5% discount, 10th of month. †21-in. diam. ‡Price per 2-ft. length.

New Kansas Rock Products Enterprise

A SILICA drying and screening plant is to be erected near Fowler, Kan., on a lease at once, it was announced recently. The Pumicite Corp. of St. Louis, Mo., has given a contract for the erection of the plant at a cost of $50,000. The plant will make pumicite. A switch from the Rock Island railroad to the new plant is being arranged for by the company.

Pacific Lime Company Buys Steamship

THE STEAMSHIP *El Cicuta*, which was sold recently by James Griffiths and Son of Seattle, Wash., to the Kingston Navigation Co. of America, has been rechristened the *Texada*. The vessel was named for Texada island, where the plant of the Pacific Lime Co., of which the Kingston company is a subsidiary, is located.

The ship is to be used in the coastwise service between British Columbia ports and California by her new owners.—*Seattle* (Wash.) *Journal of Commerce.*

United States Gypsum Co. to Modernize Rocky Mountain Plants

PLANS are under way to modernize the former Northwest Gypsum Products Co. mill near Heath, Mont., according to an announcement from the United States Gypsum Co., which recently purchased the mill. The mill equipment will be revamped to make possible the manufacture of gypsum plaster in the most modern manner, and the appearance of the mill structure and site will be improved.

The mill at Heath is the 27th to be added to the chain operated by the United States Gypsum Co. Its purchase was dictated by a policy of locating manufactories near the market better to serve the building industry of the nation.

In addition to the Heath mill, the United States Gypsum Co. operates western mills at Denver, Midland, Calif., and Laramie, Wyo. —*Helena* (Mont.) *Record-Herald.*

Shipping Limestone from Ohio to Michigan

AFTER taking aboard the first large cargo of stone shipped from the new docks of the Wagner Quarries Co. at Sandusky, Ohio, the freighter *Fontana*, Capt. A. S. Carlson, cleared this port June 22 for Port Huron, Algonac and other Michigan points.

There were 5500 tons of Erie county limestone in the *Fontana's* hold as hatch covers were closed. All had been loaded by a new belt conveyor loader recently installed on the docks—and most of it at the rate of 700 tons an hour, which is the capacity speed of the machine. There have been many smaller cargoes shipped from the new stone dock since opening of navigation.

Officials of the quarries company were jubilant that their ambitions of many months standing had been realized. To them the *Fontana's* arrival and the deadening din of stone as it rattle and banked into the steel bowels of the ship from the loader, represented the beginning of a new era of waterfront activity and industrial progress.

Due to lateness of the season and the investment just recently made, there is no expectation of "money-making" this year, it was said. However, beginning next year, with the ever-increasing demand for stone and the enlarged market field that is opened through utilization of water as the transportation medium, hundreds of thousands of tons of the local product will be shipped.

"It would be impossible to ship that into Michigan by rail, because of the rates," said one member of the company recently, as he watched carloads of the stone being dumped into a hopper, thence to be carried by endless belt over the sides of the waiting vessel. —*Sandusky* (Ohio) *Register.*

New Alabama Limestone Project

THE Marianna Lime Products Co., of Marianna, Fla., is inaugurating in Alabama a company to be known as Alabama Lime Products Co. This company has acquired valuable lime-rock deposits in Covington county near Florala. These deposits contain lime-rock which is very close to 100% pure in calcium carbonate. It is said that this lime-rock is even higher in quality than the lime-rock which has been so successfully used in the many miles of lime-rock paving in the state of Florida.

Marianna Lime Products Co. is now assembling the necessary machinery and making the necessary preparations for its crushing plant which will be located at McRae on the Central of Georgia railroad. The Central of Georgia Railroad Co. will construct a spur line railroad from its main line to the site of the new Alabama Lime Products Co.

There is a vast paving program in the making for this section of Alabama and the Alabama Lime Products Co. comes to Covington county at an opportune time to provide paying material for the many paving projects which lie ahead. The Marianna Lime Products Co. has just obtained a contract to supply lime-rock material for the first lime-rock road to be constructed in Alabama. This road is known as the Bee-Line highway and extends northward from the Florida state line to the city of Dothan. A contract for this paving has been let by the firm of Hazen and Grimes of Sarasota, Fla.—*Florala* (Ala.) *News.*

Rock-Cut Stone Co. Buys Two More Plants

CONTROLLING interests in the Watertown Stone Products Co., Inc., and the Lacona Sand and Gravel Co., Inc., two of the largest concerns of their kind operating north of the main line of the New York Central, have been disposed of to the Rock-Cut Stone Co. of Syracuse, N. Y. S. D. Ormsby, Watertown, N. Y., was the president of the company.

The new owners of the two companies operate the largest crushed stone and stone products company in the central part of the state. They own a large crushed stone plant at Jamesville and another at Auburn. In addition to these they have a sand and gravel operation at Ballina near Syracuse. W. L. Sporborg and H. Seitz are the operating heads of the Rock-Cut company.

The Watertown Stone Products Co. was organized in this city in 1920 by S. D. Ormsby. Property near Water street on the Watertown-Philadelphia line of the New York Central was purchased and stone crushing operations started. The business of the company grew steadily and new machinery and equipment has been added from time to time until the company now ranks as the largest of its kind in northern New York.

The company has machinery for the manufacture of concrete block and at times when there is a demand, large quantities of block are produced. The chief products of the concern, however, are crushed stone and agriculture ground limestone. The limestone is disposed of both direct to farmers and to wholesale dealers.

The company has been carrying on a big business with the New York state highway department and the county highway departments of various counties in northern and central New York.

Considerable of the products of the company was shipped out by railroads and the rest in a fleet of trucks operated by the firm.

Stuart D. Ormsby, the organizer of the company, has served since as its president. He formerly lived in Chicago, moving to Belleville, Jefferson county, in 1914. He operated a large farm near Belleville until 1920 when he moved to this city and organized the stone products company.

Mrs. Ormsby has served as secretary and treasurer, and E. R. Ormsby as vice-president.

The Lacona Sand and Gravel Co. was organized a year ago last February, also by Mr. Ormsby. This concern owns one of the largest sand and gravel pits in the northern part of the state at Lacona. The plant has been in operation since shortly after the organization of the company.

Mr. Ormsby is president of the Lacona company, Harry J. Yoder, vice-president, and C. M. Ormsby, secretary and treasurer.

Both the Watertown Stone Products Co. and the Lacona Sand and Gravel Co. will be continued to be operated under the same name.

Mr. Ormsby will serve for the time being as acting president of the two concerns, but he plans to retire within a short time. He stated recently that he has no plans for the future.

It is understood that the Syracuse buyers plan to expand and to increase the amount of production by installing more equipment and machinery.

The entire stock of the Watertown Stone Products Co. was held by Mr. Ormsby and members of his family. The family also controlled the Lacona company, but Mr. Yoder held considerable stock, as did a number of Watertown and Lacona residents.—*Watertown* (N. Y.) *Standard.*

Georgia Portland Cement Co. Starts Erection of New Plant

FIVE CARLOADS of building material have arrived for the Georgia Portland Cement Co. plant at Sandersville, Ga. This material has been placed on the special sidetrack leading from the main line of the Sandersville railroad. The siding has been completed to within a few hundred yards of the plant site and will be pushed to completion just as soon as another shipment of steel rails arrive.

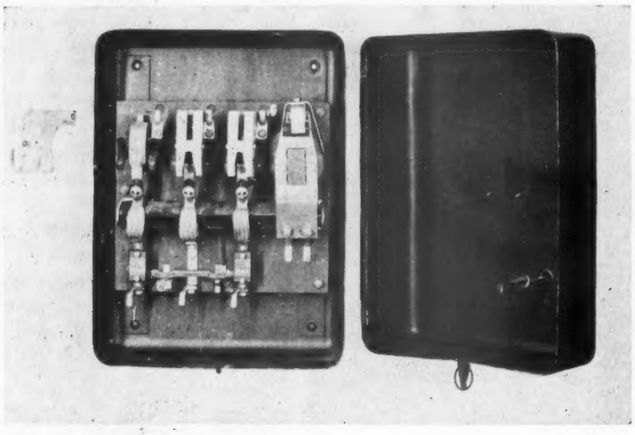
It is understood that the first building to be erected on the cement site will be that of the office. This structure will be of brick and hollow tile and amply large to take care of the various departments of the company. Ninety days time will be required to finish the building. Following this work the matter of building foundations for the huge plant will begin.

A contract has been placed by the company for the machinery to be used in the manufacture of cement. First shipments of this machinery are expected during the month of September or just as early as the buildings will be ready. The new plant will employ several hundred men and will greatly stimulate business in both Tennille and Sandersville. This industry will be located about half way between the two cities and will cost $2,000,000 when the entire plant has been completed.—*Sandersville* (Ga.) *Progress.*

New Machinery and Equipment

Magnetic Switch to Throw Motors Across the Line

GENERAL ELECTRIC CO., Schenectady, N. Y., has announced a new magnetic switch, suitable for throwing squirrel-cage motors directly across the line, or for use as a primary switch for a wound-rotor motor the secondary of which is handled by a drum controller. The new switch bears the G. E. designation CR-7006-D-31.



Magnetic switch with cover and one blowout removed

This switch consists of a triple-pole, restricted-blowout type, magnetically-operated contactor with normally open interlock, and two hand-reset, temperature-overload relays, all mounted on a molded base and enclosed in a drawn-shell, steel enclosing case. It is designed for use on standard voltages and frequencies, and maximum horsepower ratings are as follows:

Volts	2- or 3-phase, 3-wire	2-phase, 4-wire
110	.....	.....
220	50	60
440	100	125
550	125	150
600	125	150

Overload protection is provided by two temperature-overload relays which, upon an overload, open the contactor. The operation of either or both relays trips the contact mechanism so that all phases of the motor are properly protected.

The switch is ordinarily operated by means of a "start-stop" push-button station of the momentary-contact type and with an extra pole on the magnetic contactor to provide an electrical interlock for the holding circuit. If such a push-button station is used and the voltage fails, the contactor will open and will not close on return of voltage.

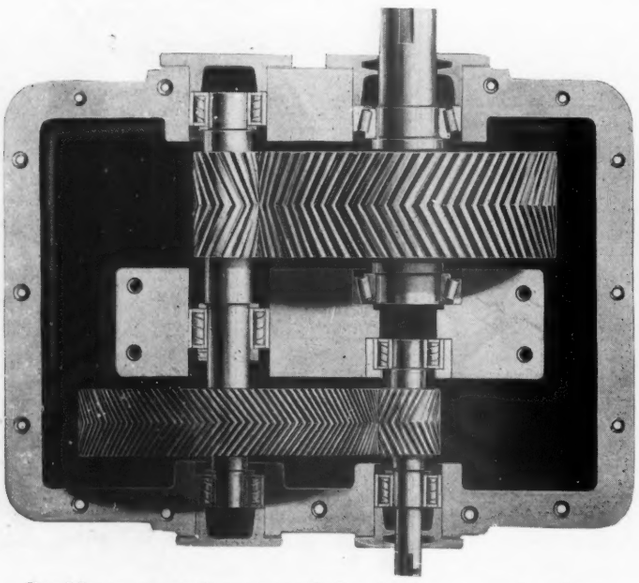
When the switch is used to handle the primary circuit of a wound-rotor motor in connection with a secondary drum switch, the push-button station is not required, as provision is made in the switch for closing the contactor coil circuit as the switch handle is turned to the first point, and to open it in returning the handle to the "off" position, thus providing undervoltage protection.

New Speed Reducer Uses Roller Bearings

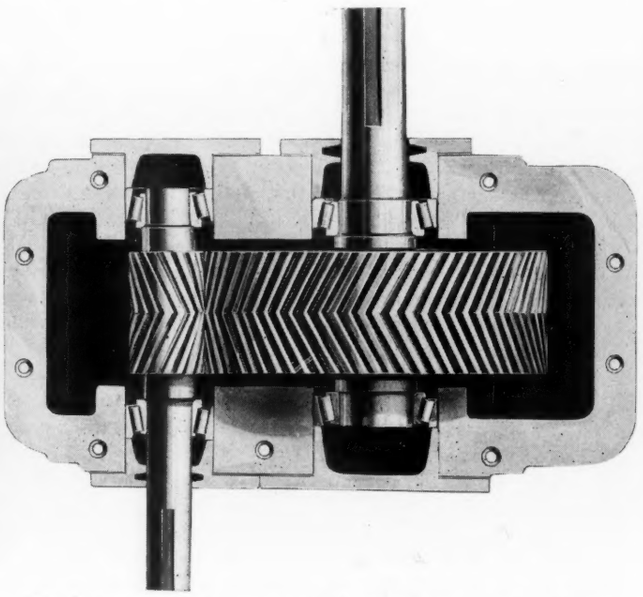
THE D. O. James Manufacturing Co., Chicago, Ill., have announced new, generated, continuous-tooth, herringbone speed reducers made in both single and double types. These reducers are new in that they are now fully equipped with anti-friction Hyatt roller bearings on the high, intermediate and slow speed pinion shaft, and Timken roller bearings on the slow speed gear shaft. This latest addition in bearings now gives to James herringbone units an efficiency of highest rating, it is claimed.

Polysius Cement-Mill Machinery To Be Made in United States

THE Polysius Corp., Bethlehem, Penn., designers and engineers of portland cement plants, and manufacturers, in Germany, of cement-mill machinery and equipment, announces that it has completed arrangements with the I. P. Morris Corp., a subsidiary of Cramp and Morris Industrials, Inc., of Philadelphia, Penn., to manufacture its line of cement-mill machinery in this country, from designs developed in Germany.



Double type continuous-tooth herringbone speed reducer equipped with roller bearing



Single type, continuous-tooth herringbone speed reducer having roller bearings

Full-Mechanical Gas Producer

R. D. WOOD AND CO., Philadelphia, Penn., have recently brought out a new full mechanical gas producer known as type 5B-10. It operates on the same principle as the company's "Heavy Duty" gas producer, and the manufacturer claims the new producer has increased gas making capacity and lower power, steam and water consumption.

The producer has the following main features: (1) Full mechanical operation from the feeding of coal to removal of ashes. (2) Positive agitation of fuel bed by means of a single, straight poker bar, which can be easily and quickly replaced. (3) A mechanical coal feeder without metal to metal contact between stationary housing and multiple pocket drum. This construction greatly reduces wear, and gas leakage between the stationary and moving member is prevented by means of a water seal. (4) A revolving ash pan, supported by three accessible conical rollers, rotating at the same speed as the producer shell. This construction prevents grinding of ashes and subsequent increased resistance to the passage of the blast. (5) An adjustable ash plow, permitting continuous plowing of ashes, regardless of the amount of coal gasified. The ashes are further agitated and moved from the center of the producer towards the outside of the ash pan by means of a stationary agitating blade. (6) A noiseless turbo-fan blower of multiple steam nozzle design insuring greatest economy in steam consumption and perfect control of blast saturation. (7) A self-supporting construction permitting installation independent of producer building. The three supporting columns carry the conical shell supporting rollers and horizontal thrust rollers. (8) A water cooled top plate of steel plate construction, heavily reinforced by structural steel shapes and provided with checkered cover plates. (9) A simple driving mechanism for continuous rotating motion of producer shell and agitating bar, each being driven by a single shaft without the employment of levers, links, universal joints, etc. (10) A simple layout of producer foundation requiring about 15 cu. yd. of concrete.

From an installation in a steel mill the following operating data have been obtained:

The coal gasified is Lincoln Gas Coal Co.'s egg and nut "Pittsburgh Vein" of the following analysis:

Moisture	1.38%
Volatile matter	38.40%
Fixed carbon	55.90%
Sulphur	2.16%
Ash	5.70%
B.t.u. per lb.	13580
Fusing point of ash	2200 deg. F.

The rate of gasification, depending upon the demand of the heating furnaces, varied from 3750 lb. to 5500 lb. per hour, or from 47.8 lb. of coal per sq. ft. of fuel bed area. The gas produced from this coal was of uniform quality and averaged 162.3 B.t.u. (low value at 62 deg. F.) per cubic foot containing 46.5% combustibles.

Average Gas Analysis

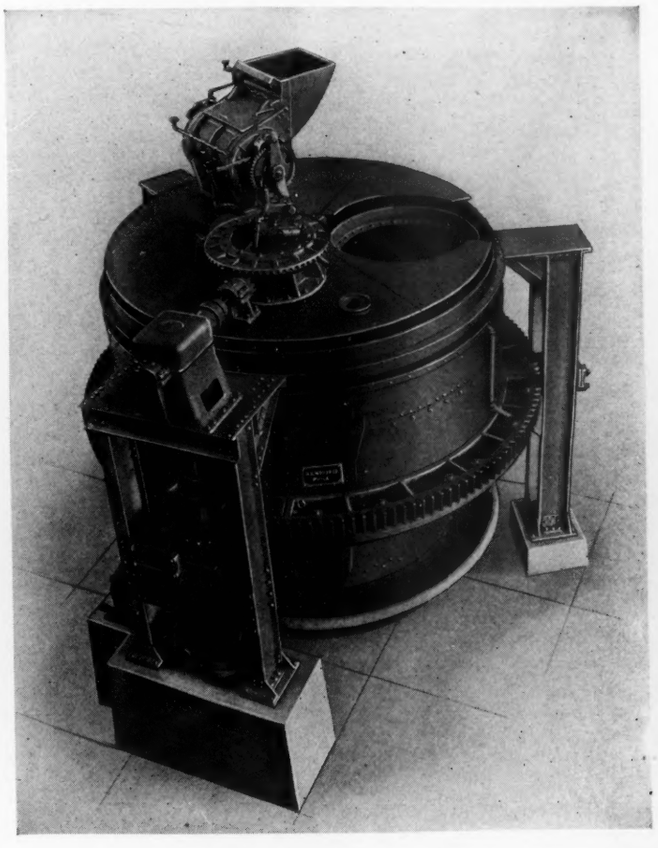
CO_2	5.8%
CO	26.2%
CH_4	3.8%
C_2H_4	.8%
H_2	15.7%
O_2	.2%
N	47.5%

The analysis of the producer ash given below shows how thoroughly the coal is converted into gas, the carbon content being only 0.355% of the total carbon contained in the coal as charged into the producer.

Average Ash Analysis

Silica	43.10%
Aluminum oxide	25.95%
Ferric oxide	23.35%
Sulphur	.44%
Phosphorus	.06%
Lime	1.50%
Carbon	5.60%

During the several months of operation covered by the period of observation, no hand poking was done and the fuel bed at all times was level and loose, permitting a ½-in. dia. measuring rod to be pushed down its entire length. A gas temperature of 1400 deg. F. was maintained, no hot spots nor blow holes were developed and the wall remained free of clinker. Ashes were plowed continuously. The turbo-fan blower operated at approximately 50-lb. steam pressure and the total power consumption under maximum load was less than 3-hp. The agitating bar used 270 gallons of cooling water per hour, the overflow cooling the plate.



New Automatic gas producer

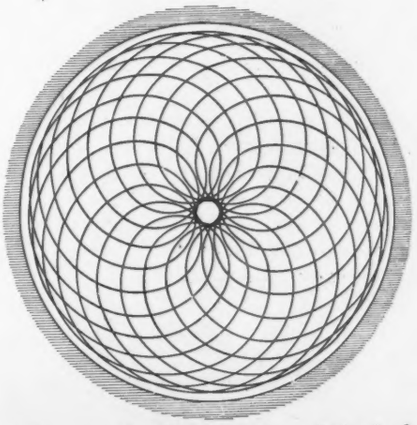
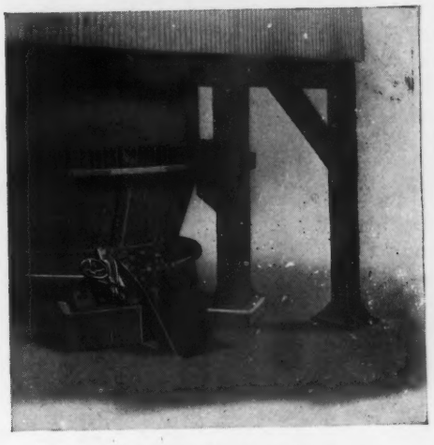


Diagram showing agitation of the fuel bed during six revolutions



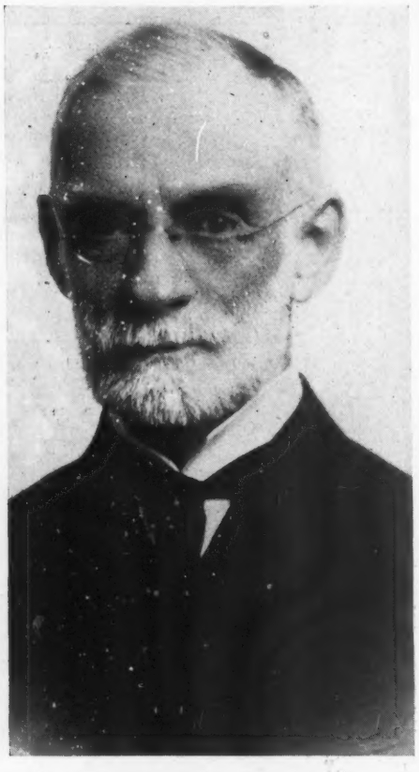
Mechanical ash discharge

George H. Boynton

A BRIEF note in Rock Products, May 12, recorded the death of G. H. Boynton, president of the Northern Gravel Co., Muscatine, Iowa, on April 20, at the age of 75 years. While he was not a pioneer in the sand and gravel industry in the sense of being an early producer of commercial sand and gravel, he was a pioneer in its production and use in railway construction.

George Herbert Boynton was born in New Hampshire of old New England stock on September 3, 1852. His early boyhood was spent in the neighborhood of Watertown, Mass. In 1866 the family moved to Rock Island, Ill., where he went through the public schools. Soon after that he went to work on Government Island, where he served as a timekeeper for a short period. Subsequently he went to Germany, where he studied civil engineering.

In 1877 Mr. Boynton was made city engineer of Rock Island. At the expiration of his term of office he entered the employ of the engineering department of the Chicago, Rock Island and Pacific R. R. He remained with the railway company until 1907 in various capacity at Davenport and Chicago.

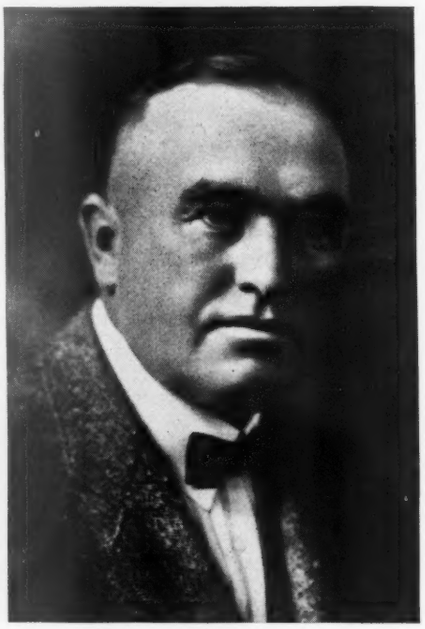


G. H. Boynton

Leaving the railway company, in 1908 he returned to Davenport as a general contractor. In 1914 he organized the Northern Gravel Co., Muscatine, which was his main interest from that time until his death. He had been a member of the American Society of Civil Engineers, since 1884, and in 1918, an honorary member.

Robert E. Rogers

ROBERT E. ROGERS, secretary of the Union Rock Co., Los Angeles, Calif., well-known business man and club man, one of the most widely known of Pacific coast yachtsmen, died of heart disease June 18



Robert E. Rogers

shortly before 12 o'clock at his home, 522 South Kingsley drive, Los Angeles.

An important figure in business circles in Los Angeles, Mr. Rogers was more widely known as an enthusiastic yachtsman. He was fleet captain of the Newport Harbor Yacht Club and a member of the California Yacht Club. His steam yacht *Sea Bee* was flagship of the Newport fleet, and he was owner of several other yachts. He participated in the more important races and won many trophies, and he and his yachts were familiar figures everywhere in Pacific waters.

Last year Mr. Rogers shipped a yacht overland and sailed in Atlantic waters around New York and up the Hudson.

Mr. Rogers was a Knight Templar and a Shriner and a member of the Jonathan Club and the Hollywood Athletic Club.

Born in Plattsburg, N. Y., 48 years ago, Mr. Rogers came to Los Angeles about 25 years ago. For years past he was engaged in the contracting and road building business, associated with his brothers in the firm of Rogers Brothers Co., of which he was secretary. He was active with his brothers in the organization and management of the Union Rock Co.

William L. Urschel

A CAREER that had carried him from boy to millionaire industrial chief was cut short Friday afternoon, June 29, in Cincinnati, Ohio, when William L. Urschel, 52, president of the William L. Urschel Lime and Stone Co., Toledo, Ohio, and of many other Toledo enterprises, died suddenly while driving with Fred Rosche, president of the Ohio Sewer Pipe and Supply Co. Mr. Urschel was en route to Reading, Ohio, to inspect property. Apoplexy was given as the cause of death.

William Urschel, born in Canton, Ohio, May 9, 1876, spent his early life on a farm and went to Woodville to enter the lime business with his father and two brothers 30 years ago.

After the death of the father, Daniel F. Urschel, one son, moved to Kansas and entered the ranching business. One of his large ranches is near Florence, Kan. The two brothers, William L. and J. J. Urschel, continued the Woodville Lime Products Co., one of the most successful in the country, until 1927 when William L. Urschel sold his interests to his brother, J. J., to organize his own company bearing his name. It has grown to be a powerful factor in the lime industry.

Mr. Urschel also owned the Toledo-Baltimore Bottle Cap Co., with headquarters in Miami street. He was head of the Urschel Engineering Co. and one of the large shareholders in the Valve Bag Co. until a few months ago.

A lover of the sea, Mr. Urschel for many

William L. Urschel

years was active in yachting circles and owned one of the largest cruisers of the Toledo fleet. He was a former commodore of the Toledo Yacht Club. He was interested, too, in the development of the Toledo Zoological park, being a generous contributor to the fund with which the new carnivora house was built.—*Toledo* (Ohio) *Blade*.

News of All the Industry

Incorporations

Alex Shapiro, Inc., Paterson, N. J. Sand and gravel.

Parsons Cement Products Co., Parsons, Kan., $10,000.

Ruth Concrete Products Co., Vineland, N. J., $10,000. E. F. Miller, Vineland.

Bald Mountain Lime Co., Mechanicville, N. Y., $40,000. R. W. Fisher, Mechanicville.

M. S. and B. Sand and Gravel Co., Wallington, N. J., $100,000. Jos. B. Stadtmauer.

Lexington Quarry Co., Lexington, Ky., $20,000. Louis M. Winges, 226 Castlewood Drive, Lexington.

Dinallo and McEligot Co., Newark, N. J., 1000 shares. To manufacture and deal in cement products.

Saxton and Dickinson, Middletown, N. Y., $10,000. F. W. Annabel, Bath, N. Y. Sand and gravel.

Waterford Sand and Gravel Corp., Waterford, Conn., $50,000. Aaron Agrin and others, all of New London, Conn.

Panhandle Sand and Gravel Co., Wilmington, Del., $200,000 and 100,000 shares, no par. A. L. Miller, Wilmington.

Victor Mica Co., Hagerstown, Md. Raymond J. Funkhouser, First National Bank Bldg., Hagerstown; Robert S. Beck.

Concrete Building Units Co., Oak Park, Ill., increased its capital stock from $50,000 to $75,000, and increased its directors from three to five.

Independent Lime & Stone Co., Port Washington, Wis., has filed a petition in bankruptcy, listing debts as $55,644.53 and assets as $15,951.50.

Louks Sand and Gravel Co., Newark, Ohio, $40,000 preferred, 100 shares, no par. Coleman R. Louks, Nellie M. Bolin-Louks, James F. Baird.

Elizabethton Cement Products Co., Elizabethton, Tenn., $10,000. Fred C. Clarke, Maurice E. Schramlin, Ethel G. Clarke, Alice E. Schramlin, J. Thomas Smith.

Wilhoyte Decorative Plaster Co., Gary, Ind., $5000. Howard Wilhoyte, Matalea B. Wilhoyte, A. W. Van Cleave. Deal in and manufacture wall plaster and cement mortar.

Regal Marble Corp., Summerville, Ga., $15,000. E. W. Sturdivant, Wesley Shorpshire, C. Eugene Allen and others. Quarrying, mining, manufacturing, operation and sale of rock, marble and minerals.

Quarries

Camp Consolidated Rock Products Co., Brooksville, Fla., has been reopened recently.

Cearwater Lime Products Co., Oropino, Idaho, is shipping limestone to the Columbia River Paper Mills Co., Vancouver, Wash.

Le Conte Marble Co., Johnson City, Tenn., has bought the property of the former Farragut Marble Co. in South Knoxville, Tenn.

Colorado Fuel and Iron Co., Salida, Colo., has informed its employes that its quarry at Calcite, Colo., will not be closed when its new Monarch quarry is put in operation.

Community Builders, Ltd., operated by W. J. McElroy and his associates, has purchased the quarry property at Limestone, Ont., near Georgetown, and will actively develop the property.

Georgia Limerock and Cement Co., Perry, Ga., has leased of James L. Wilcox at Abbeville, Ga., an acreage of limestone said to analyze 90% $CaCO_3$. A. C. Cobb will manage the quarrying operations. It is expected to ship 20 to 30 cars a day.

Standard Trap Rock Co., Nyack, N. Y. Workmen who have been digging the foundation for the enormous crusher at Tallman Mountain have reached a depth of 70 ft. below the surface. The construction work is in charge of the Burrell Construction and Engineering Co. of Chicago, who have brought to Piermont a large force of their own employees. Several carloads of machinery for the new quarry were unloaded at the siding at Orangeburg recently and are being set in place at the present time.

Sand and Gravel

Corsica Sand and Gravel Co., Centreville, Md., has been formally and legally dissolved.

Ohio River Sand and Gravel Co., Wheeling, W. Va., suffered some damage by fire on June 15.

Huntington Sand and Gravel Co., Huntington, Ind., has filed certificate of preliminary dissolution.

Smith-Harrington Construction Co., Marseilles, Ill., has opened the Barnes gravel pit at Ottawa, Ill.

Greenville Gravel Corp., Greenville, Ohio, has officially changed its name to the **American Aggregates Corp.**

Harry M. Waugh, Bluefield, W. Va., is planning to build a sand and gravel plant of 800 tons daily capacity.

Royal Sand and Clay Products Co., Ottawa, Ill., began operations recently under the supervision of Maurice MacTragan.

William Ruprecht, St. Louis, Mo., has purchased the northwest corner of Chouteau and Rankin avenues to be utilized for a sand and gravel operation.

J. Harold Fisher and **Richard K. Long**, Honesdale, Penn., have purchased a gravel deposit 1½ miles south of Honesdale and will begin development at once.

Superior Sand and Gravel Co., Charleston, W. Va., has leased the holdings of the Midway Sand and Gravel Co. at Parkersburg, W. Va., for a period of two years on a monthly royalty basis of $300.

Northeast Missouri Sand and Gravel Co., Hannibal, Mo., has resumed work at its Salt river pit, south of New London, Mo., after a shutdown caused by high water. Little damage was done to the machinery during the flooding.

John W. Peters, Burlington, Wis., has acquired ownership of 86 acres of gravel property formerly owned by the defunct Burlington Sand and Gravel Co. The property adjoins the present operation of Mr. Peters, where he is producing about 20 cars per day. Material is excavated by cableway excavator and clam-shell.

Baker Gravel and Material Co. has been organized at Mobile with capital of $25,000. J. G. Murphy is president; C. G. Baker, vice-president and manager of production, and A. T. Baugh, secretary-treasurer and sales manager. This company is separate from the Baker Sand and Gravel Co., of Tuscaloosa, which Mr. Baugh has represented in Mobile for several years.

Cement

Northwestern Portland Cement Co., Grotto, Wash., has started shipments. The product is said to have better than standard 28-day strengths in seven days.

Sandusky Cement Co., York, Penn., suffered a loss of $15,000 to its rock-crushing unit on June 14. The crushing plant was of timber construction. Reconstruction was started at once.

Alpha Portland Cement Co., Easton, Penn., has leased for eight years, beginning May 1, 1929, space in the New York Central Bldg., Park Ave. and 46th St., new York City, for executive offices.

San Antonio Portland Cement Co., San Antonio, Tex., is building a new power-house extension and raw-mill building. W. E. Simpson Co. is engineer, 412 National Bank of Commerce Bldg., San Antonio.

Keystone Portland Cement Co., Bath, Penn. It has been announced that the new plant would be in operation by the second week in July. Persistent rumors of negotiations for the sale of the plant were set at rest by the statement that it is not for sale.

Penn.-Dixie Cement Corp, New York, N. Y. The plant at Valley Junction, Iowa, which was formerly owned by the Pyramid Portland Cement Co., has increased its output by nearly one-third since the Penn-Dixie organization took it over, and it is contemplated to increase the production to a still greater extent.

Canada Cement Co., Montreal, Que., has received an order for 125,000 bbl. of cement from the Calgary Power Co., to be used by that company in the construction of a new hydro-electric plant to be built at the junction of the Ghost and Bow rivers. The cement will be furnished from the Canada company's Exshaw plant.

Great Lakes Portland Cement Corp., Buffalo, N. Y., has purchased a second parcel of land in Cleveland, Ohio. The acquiring of this parcel completes a program in which the Great Lakes Portland Cement Corp. purchased from the American Ship Building Co. another parcel of 67,000 sq. ft. of ground area adjacent to the Sycamore slip in order to maintain its own Cleveland warehouses and docks. M. H. Hammond of the Great Lakes Portland Cement Corp. at Buffalo said his company proposes to erect warehouses and docks along Sycamore slip costing well over $500,000. The work will be completed by late fall. Dredging of the slip has been started. The company plans on the operation of at least one boat between Cleveland and Buffalo.

Cement Products

Robert North, Neosha, Mo., has installed a concrete mixer and three block machines in his new factory in Neosha and has opened the plant for business.

Universal Concrete Products Co., New Martinsville, W. Va., has selected Columbus, Ohio, for the location of a branch plant. The plant will be adjacent to the present plant of the Arrow Sand and Gravel Co., and will be finished about September 1.

R. E. M. Cement Products Co., Mt. Holly, N. J. George F. Rendell has purchased the interests of his partners, N. Perry Edmunds and Alfred J. Mullen in the R. E. M. company and is now the sole proprietor. Mr. Rendell expects to improve and expand the present property of the company.

Lime

Allwood Lime Co., Rockwell, Wis., was threatened by fire recently, when some of its stored cordwood caught fire, entailing a loss of about $5000.

Marblehead Lime Co., Chicago, Ill. Wallace E. Wing, chemist at the Hannibal, Mo., plant has been appointed manager of that plant, succeeding L. R. Stolberg, who has been in charge for the past 10 years. Mr. Stolberg has gone to Pittsfield, Mass., to become traffic manager of the New England Lime Co.

Gypsum

Best Bros. Keene's Cement Co., Medicine Lodge, Kan., is increasing its quarry operation. A second crusher has been installed and put into operation. also additional cableway buckets to take care of the increased crushing capacity. Another electric generator and two more electric drills have been purchased, bringing the number of electric drills in the quarries up to a total of five.

National Talc, Limited, is considering the establishment of a manufacturing plant in Calgary, Canada, to utilize the raw talc deposits of the Rocky Mountains. About seven miles of the new road up the Red Earth Valley from Massive to the blue talc property on the Red Mountain were constructed last summer and work is again proceeding with the idea of completing the road by August. Production will be started on the blue talc property as soon as weather conditions permit. The American Lava Corporation of Chattanooga, Tenn., are reported willing to purchase all of this year's production of the plant.

Alabama Mica Co., of Birmingham, Ala., has registered 2500 shares of common stock with the State Securities Commission to be sold at $10 a share, par value of the stock.

Personals

Foster D. Snell, A. M., Ph. D., consulting chemist, announces the removal of his office from the Pratt Institute to 130 Clinton St., Brooklyn, N. Y.

Morris Kind, president, Hercules Cement Corp., Philadelphia, Penn., has been elected to the board of directors of the Guardian Bank and Trust Co. —a new organization.

Hubert Woods, chemical engineer, Riverside Portland Cement Co., Riverside, Calif., was the principal speaker at the dinner meeting of the

Pasadena Engineering Society, at Pasadena, Calif., recently.

O. A. Scott, Findlay, Ohio, who was reported in the May 12 issue of ROCK PRODUCTS to be starting in the field of road construction under the name of the Highway Materials Co., has since changed the name of his new company to the Bituminous Materials Co., to avoid conflict with another concern having a similar name.

Obituaries

Floyd W. Schubel, superintendent, Port Crescent Sand and Fuel Co., Port Austin, Mich., was killed June 12, when caught in a slide of sand in one of the plant bins.

Manufacturers

Magnetic Mfg. Co., Milwaukee, Wis., announces the discontinuance of its former sales office and the opening of a direct factory branch office at 211 N. Des Plaines St., Chicago.

Chicago Pneumatic Tool Co., New York City, announces the appointment of Geo. J. Lynch as district manager of sales at 1931 Washington Ave., St. Louis, Mo. Mr. Lynch was formerly assistant district manager in the New York office.

Naylor Pipe Co. is the new name of the former Naylor Spiral Pipe Co., of Chicago. The company announces that there will be no change in the management under the new organization. The announcement also states that the plant facilities have been increased 200%.

Construction Machinery Co., Waterloo, Iowa, has merged with the Marsh-Capron Co. of Chicago, and the new organization will retain the name of the former company. This merger brings together the manufacturer of a line of non-tilting mixer equipment with the maker of a tilting line of equipment, and the new company will thus have a very complete line of mixing machinery. The merger is effective at once.

Van Dorn Electric Tool Co., Cleveland, Ohio, announces that it has established a warehousing and service depot at 525 East 10th St., Oakland, Calif., supplementing its sales branches at Los Angeles, San Francisco and Seattle and its service branches at Los Angeles, Seattle and Oakland. The sales departments will continue to be operated separately with W. H. Blair in charge at Los Angeles, H. W. White at San Francisco, and Roy Wise at Seattle.

Trade Literature

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Steel Street Forms. Illustrated **Bulletin No. 1024** on forms for concrete work. BLAW-KNOX CO., Pittsburgh, Penn.

Sil-O-Cel Insulating Materials. Illustrated bulletin of Celite products for use as insulating materials. CELITE PRODUCTS CO., Chicago, Ill.

Kiln Linings. Announcement of record made by seven Arcofrax kiln linings in cement plants. GENERAL REFRACTORIES CO., Philadelphia, Penn.

Fire Brick. Announcement of the facilities of the company and the various products. LACLEDE-CHRISTY CLAY PRODUCTS CO., St. Louis, Mo.

Portable Gravel Crushing and Screening Plant. Announcement of new portable plant. GOOD ROADS MACHINERY CO., Kennett Square, Penn.

Hammer Crushers. Illustrated **Bulletin No. 75** of hammer crushers, with complete specifications and detail drawings. THE BONNOT CO., Canton, Ohio.

Unit Heaters Illustrated announcement of "Chinookfin" unit heaters, showing advantages and giving of capacities. BAGLEY BLOWER CO., Milwaukee, Wis.

Continuous Floor Armoring. Bulletin on steel reinforcing and armoring for floors and platforms in industrial plants. IRVING IRON WORKS CO., Long Island City, N. Y.

Data on Wear and Machinability of Cast Iron. Technical article on nickel cast steel illustrated with pictures and drawings. INTERNATIONAL NICKEL CO., New York City.

Patching Holes and Cracks. Bulletin on the use of "Tarmac" in patching pavements, such as found around industrial plants. AMERICAN TAR PRODUCTS CO., Pittsburgh, Penn.

Pressed Steel Mixing Boxes. Announcement of all-weather pressed steel mixing boxes for cement work. COMMERCIAL SHEARING AND STAMPING CO., Youngstown, Ohio.

Air-Jacketed Motors. Illustrated **Bulletin No. 151** on the new totally-enclosed, self-cooled pipeless electric motors, with detailed drawings of the motor. WAGNER ELECTRIC CORP., St. Louis, Mo.

Self-contained Vertical Stripper. Announcement of the new "Ideal" self-contained vertical power stripper for use in products plants. CONSOLIDATED CONCRETE MACHINERY CORP., Adrian, Mich.

Gasoline Locomotives. Illustrated **Bulletin No. 2824** on narrow gage gasoline locomotives ranging from 10 to 30 tons with complete specifications and detailed drawings. GEO. D. WHITCOMB CO., Rochelle, Ill.

Renewable Fuses. Illustrated **Bulletin 206-B** describing "powder-packed" renewable fuses, with engineering data and tests on overload time-lag and watt-loss saving. TRICO FUSE MFG. CO., Milwaukee, Wis.

De Laval Pumps at Palm Beach. Illustrated record of the pump installation at Palm Beach and West Palm Beach, with figures and diagrams of installation. DE LAVAL STEAM TURBINE CO., Trenton, N. J.

Cranes, Shovels, Draglines, Etc. Illustrated 16-page catalog of the new speeder model B-2, with tables and diagrams of ranges, clearances and specifications. SPEEDER MACHINERY CORP., Cedar Rapids, Iowa.

Gyratory Crushers. Illustrated, 25-page **Bulletin No. 2100** of "Bulldog" gyratory crushers, with tables of capacities, setting distances and retained percentages. TRAYLOR ENGINEERING AND MFG. CO., Allentown, Penn.

A Mouthful at Every Bite. Illustrated 16-page catalog of various types of buckets for excavating equipment, providing complete information regarding weights, capacities and dimensions. OWEN BUCKET CO., Cleveland, Ohio.

Transmission and Material Handling Equipment. A new loose-leaf catalog of the "Vallerion" line of transmission and material handling equipment, including illustrations and engineering data. SPROUT WALDRON AND CO., Muncy, Penn.

Truss Wheel Dump Wagons and Trailers. Illustrated **Bulletin No. 101** on the use of "truss wheels" on trailers and dump wagons for operation particularly on soft ground; includes specifications. ATHEY TRUSS WHEEL CO., Chicago, Ill.

Automatic Balancer for Portable Tools. Illustrated announcement of the new Pedwyn balancer for suspending, balancing and lifting portable tools and loads weighing up to 150 lb. CHICAGO PNEUMATIC TOOL CO., New York City.

Unique Mixers. Illustrated, 20-page catalog **No. 32-A** of different types of concrete mixers. **The Gyro-Sifter.** Illustrated, **Catalog No. 41-A** of this particular type of vibrating screen containing tables of specifications. ROBINSON MFG. CO., Muncy, Penn.

Mechanical Gas Producer. Illustrated **Bulletin No. 85** on W-S-M Type L, mechanical gas producer, containing a number of tables on producers of this type. **Wellman Mechanical Double-Bell Fuel Feed.** Announcement of new double-bell feeder. WELLMAN-SEAVER-MORGAN CO., Cleveland, Ohio.

Best Motor Oils Are Vital. Booklet by C. E. Carpenter on motor oils, thoroughly discussing tests and arguments given for various types of oil. **Belt Dressing Facts.** Pamphlet discussing some of the difficulties encountered with belt transmission and their correction. E. F. HOUGHTON AND CO., Philadelphia, Pa.

Dust Menaces Industrial Plants. A survey by David J. Price of the Department of Agriculture of dust explosions in chemical engineering industries. **Some Dust and Fume Recovering Installations.** A bulletin on the use and variety of applications of Dracco installations. DUST RECOVERING AND CONVEYING CO., Cleveland, Ohio.

The Milcor Manual. Catalog No. 20-E. A 96-page data book on Milcor methods, including engineering tables on reinforced concrete construction, specifications and general information regarding Milcor products, such as their four kinds of metal lath and complete line of fireproof construction materials. MILWAUKEE CORRUGATING CO., Milwaukee, Wis.

Industrial Plant Effects Marked Savings. Reprint of an article from "Power Plant Engineering" describing installation of equipment at Pittsburgh Plate Glass Co. plant. **The Economies of Carbonization at Electric Central Stations.** A paper by P. P. Soule, of the International Coal Carbonization Co., covering the economics of low-temperature carbonization as applied to central stations. INTERNATIONAL COMBUSTION ENGINEERING CORP., New York City.

A Few Drying and Grinding Problems Solved. Bulletin detailing a variety of uses for the "Ruggles-Coles" dryer, and also detailing uses of the conical mill. **Steacy Schmidt Mfg. Co. announcement.** Bulletin on the accurate workmanship achieved by this subsidiary of the Hardinge Co. **Instantaneous Control of Fuel to Burner.** Announcement of the unit coal pulverizer for controlling flow of fuel to the burner. **A Few Grinding Problems, Also Thickening, Clarifying and Filtering.** Bulletin on grinding in the conical mill and the uses of the thickener and clarifier. HARDINGE CO., York, Penn.

United States Gypsum Company Opens Boston Sales Office

LOOKING toward completion of the $2,000,000 plant under construction at Mystic Docks, Charlestown, the United States Gypsum Co. has transferred to Boston the office of its northeastern sales district. The office is at 100 Boylston street and is in charge of A. L. Sleeper as district sales manager.

The office here and the factory at Mystic Docks will serve New England with gypsum plasters, sheathing, wallboard, rock-lath and other gypsum products. The plant itself is to be of fireproof construction and will have the latest types of equipment. Gypsum rock will be brought here from Nova Scotia in ships of special construction.

Location of the plant and office in Boston are in line with the newly announced policy of the United States Gypsum Co. to build its facilities as near the places of use of its gypsum products as manufacturing and distributing facilities will allow. — *Boston* (Mass.) *Transcript.*

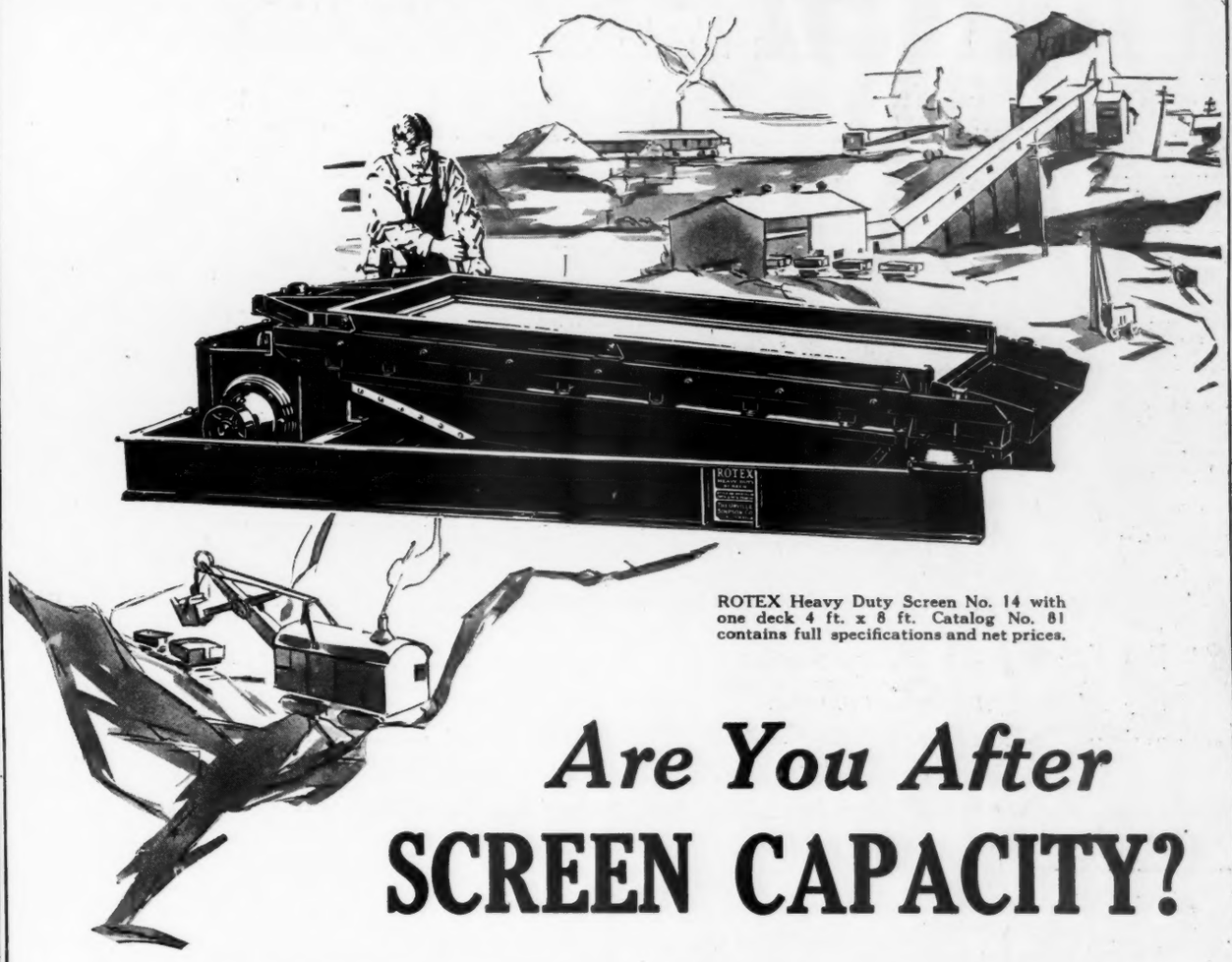
United States Gypsum Company Established Eastern Offices at Philadelphia

PREPARATORY to the construction of a complete gypsum manufactory at Fifty-eighth street and the Schuylkill river, Philadelphia, Penn., the United States Gypsum Co. has transferred its mid-Eastern district sales office from Chicago to Philadelphia. The district office, which is located in the warehouse just complete on the site of the new manufactory, is in charge of R. S. Slattery, district sales manager, and is staffed with assistants brought from Chicago.

The office here will serve, in addition to metropolitan Philadelphia, Eastern Pennsylvania, Southern New Jersey, Delaware, Maryland, Virginia and the District of Columbia, with gypsum products from the manufactory to be erected here and the manufactory in operation at Plasterco, Va.

The manufactory here will be one of the most modern in the United States. All buildings will be of fireproof construction, and equipment will be of the latest type.—*Philadelphia* (Penn.) *Public Ledger.*

ROTEX



ROTEX Heavy Duty Screen No. 14 with one deck 4 ft. x 8 ft. Catalog No. 81 contains full specifications and net prices.

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SCREEN CAPACITY?

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